APPENDIX A

Upland SQAPP

Upland Sampling and Quality Assurance Project Plan

Appendix A of the Draft RI/FS Work Plan

Bremerton Gas Works Site

Prepared for: Cascade Natural Gas Corporation

Aspect Project No. 080239-005 • Anchor QEA Project No. 131014-01.01

April 17, 2015

Prepared by

Aspect Consulting, LLC
401 Second Avenue South, Suite 201
Seattle, Washington 98104

Anchor QEA, LLC
720 Olive Way, Suite 1900
Seattle, Washington 98101

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Aspect Consulting, LLC & Anchor QEA, LLC

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Acronyms

Anchor QEA	Anchor QEA, LLC
AOC	Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study
Aspect	Aspect Consulting, LLC
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
Cascade	Cascade Natural Gas Corporation
COPC	contaminant of potential concern
DOT	Washington State Department of Transportation
DQO	data quality objective
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EM	electromagentic
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
GPR	ground-penetrating radar
GPS	global positioning system
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	investigation-derived waste
ISA	initial study area
LCS/LCSD	laboratory control samples/laboratory control sample duplicate
mg/L	milligram(s) per liter
MQI	measurement quality indicator
MS/MSD	matrix spike/matrix spike duplicate
NAPL	non-aqueous phase liquid
NTU	nephelometric turbidity units

PAH	polycyclic aromatic hydrocarbon
PID	photoinization detector
PM	project manager
PPE	personal protective equipment
PRG	preliminary remediation goal
PSI	pounds per square inch
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
RPD	relative percent difference
SDG	sample delivery group
Site	Bremerton Gas Works Site
SOPs	standard operating procedures
SOW	Statement of Work
SQAPP	Sampling and Quality Assurance Project Plan
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbons
UNC	Utility Notification Center
VOC	volatile organic compound

1 Introduction

Cascade Natural Gas Corporation (Cascade) is conducting a Remedial Investigation (RI) and Feasibility Study (FS) at the Bremerton Gas Works Site (Site) under the direction of the U.S. Environmental Protection Agency (EPA). This Upland Sampling and Quality Assurance Project Plan (SQAPP) has been prepared as Appendix A to the Draft RI/FS Work Plan to describe specific sampling and analysis protocols for field sampling activities and quality assurance protocols for chemical and physical analysis. The work is being conducted in accordance with the Administrative Settlement Agreement and Order on Consent for Remedial Investigation Feasibility Study (AOC, EPA, 2013) and accompanying Statement of Work (SOW) for the Bremerton Gas Works Site.

1.1 Project Overview

The Draft RI/FS Work Plan outlines the scope and rationale for the sampling and characterization efforts to be conducted at the Site. The Draft RI/FS Work Plan is focused specifically on information necessary and sample data required to characterize the nature and extent of contamination at the Site, assess current and future potential risks to human health and the environment, and identify and evaluate remedial alternatives. The Upland SQAPP provides for the implementation of information and data collection activities described in the Draft RI/FS Work Plan. The key data collection activities proposed to address the data needs identified in the Draft RI/FS Work Plan are as follows:

- Geophysical surveys: Magnetic, electromagnetic conductivity and/or ground-penetrating radar surveys are proposed to identify and locate buried features or anomalous conditions in the shallow subsurface that may indicate historical use or fill material.
- Shallow Soil Investigation: A total of 30 shallow soil borings and 28 test pits are proposed to identify source areas, characterize shallow soil lithology and fill material, define the lateral extent of contaminants of potential concern (COPCs) in shallow soil, and investigate the presence of and characterize non-aqueous phase liquid (NAPL) at source areas and in shallow soil.
- Deep Soil and Groundwater Investigation: A total of 16 deep borings are proposed to characterize deep soil lithology, define the extent and thickness of fill material along the shoreline and in the ravine, identify water-bearing zones and aquitards, define the lateral and vertical extent of COPCs in deep soil, and investigate the presence of and characterize the extent of NAPL. The borings will be completed as groundwater monitoring wells, which will be developed and sampled to evaluate the lateral and vertical extent of COPCs in groundwater, characterize water-bearing zones and support the investigation into the presence and nature of NAPL.
- Hydrogeologic Testing: Aquifer testing and evaluation will be conducted to evaluate the hydraulic properties of water-bearing units identified at the Site and tidal influence on groundwater conditions. The specific locations for the aquifer

testing will be dependent on site conditions observed during the investigation activities.

Additional explorations and testing may be identified as the investigation progresses. This SQAPP includes interim data communications and decision points for determining, in consultation with EPA, if additional explorations are warranted to achieve study objectives. The Draft RI/FS Work Plan identifies potential contingency studies that may be required to complete the RI/FS depending on the collected data. If contingent studies are warranted, these would be described in a work plan addendum that includes a supplemental SQAPP.

1.2 Proposed Study Area Boundaries

The initial study area (ISA) for the upland portion of the Site is defined in the Draft RI/FS Work Plan. The upland portion of the ISA includes the Former Gas Works Property and portions of neighboring properties where gas works operations, including byproduct storage and disposal, are documented or suspected to have occurred, and areas where contamination associated with operations other than the former gas works could potentially be commingled with gas works contamination. The existing data collected from areas near the boundaries of the ISA suggest that contamination associated with the former gas works may not extend beyond the upland ISA but additional data are needed to determine if this is the case. The upland ISA boundary is depicted on Figure A-1.

1.3 Document Organization

This SQAPP was prepared in accordance with EPA's guidance for developing QAPPs (Quality Assurance Project Plans; EPA 2002). EPA's guidance specifies four groups of information that must be included in a QAPP (Project Management, Data Generation and Acquisition, Assessment and Oversight, and Data Validation and Usability). Each group comprises multiple QAPP elements.

The remainder of this SQAPP is organized into the following sections:

- Section 2—Project Management
- Section 3—Data Generation and Acquisition
- Section 4—Assessments and Response Actions
- Section 5—Data Validation and Usability
- Section 6—References

2 Project Management

2.1 Project/Task Organization

Aspect Consulting, LLC (Aspect) will lead the upland portion of the RI/FS investigation activities on behalf of Cascade. Anchor QEA, LLC (Anchor QEA) will lead the marine portion of the RI/FS investigation activities. This document addresses only the upland components; the marine components are addressed in the Marine SQAPP (Appendix B). The primary responsibilities of the team members for the upland portion of the RI/FS investigation are described in the following paragraphs.

Aspect Project Manager (PM): Jeremy Porter, P.E. will serve as the Aspect PM and will be responsible for overall project coordination and providing oversight on planning and coordination, work plans, all project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the scope of work. He will also be responsible for coordinating with Anchor QEA, who will lead the marine portion of the RI/FS investigation activities, and EPA on schedule, deliverables, and other administrative details.

Field Coordinator: Carla Brock, L.G. will serve as the Aspect field coordinator for the upland portion of the RI/FS. The field coordinator is responsible for managing the field sampling activities and general field and QA/QC oversight. She will ensure that appropriate protocols for sample collection, preservation, and holding times are observed and will ensure timely delivery of environmental samples to the designated laboratories. The field coordinator will also provide QA oversight for the field sampling programs to ensure that samples are collected and documented appropriately.

Quality Assurance/Quality Control: Parker Wittman will provide QA oversight for laboratory programs to ensure data quality, oversee data validation, and supervise project QA coordination. Third-party data review and validation of analytical chemistry data will be provided by Pyron Environmental, Inc. Mingta Lin will act as the data validation project manager for Pyron Environmental, Inc.

Laboratory Project Manager: Michael Erdahl is the laboratory project manager with Friedman & Bruya, Inc. Sue Dunnihoo is the laboratory project manager with Analytical Resources, Inc. The laboratory project manager will oversee all laboratory operations associated with the receipt of the environmental samples, all chemical and physical analyses, and preparation of laboratory reports. The laboratory project manager will review all laboratory reports and prepare case narratives describing any anomalies and exceptions that occur during sample handling and analysis.

Data Manager: Parker Wittman will oversee data management to ensure that analytical data are incorporated into the project database with appropriate qualifiers following acceptance of the data validation/ QA/QC of the database entries will ensure accuracy for use in the RI.

2.2 Problem Definition/Background

The Upland SQAPP describes the sampling and analysis approach for addressing the data gaps identified in the Draft RI/FS Work Plan. The collection of supplemental data will support the definition and characterization of source areas, define the nature and extent of contamination, provide sufficient information to calculate and assess the current and future potential risks to human health and the environment, and allow for the identification and evaluation of remedial alternatives. The scope of work for the upland portions of the RI/FS will consist of subsurface investigation and collection of soil and groundwater samples for chemical and physical analysis. The work is being conducted to assess potential source areas, define the locations and characteristics of fill material, evaluate the extent and characteristics of aquifers and aquitards, define the nature and extent of contaminants of potential concern (COPCs) and non-aqueous phase liquids (NAPLs), and evaluate contaminant fate and transport. The procedures for conducting these activities are described in detail herein.

2.3 Project/Task Description and Schedule

Sampling activities described in the RI/FS Work Plan and this Upland SQAPP will be initiated following EPA approval and as outlined in the schedule in the Draft RI/FS Work Plan.

2.4 Data Quality Objectives and Criteria

Data quality objectives (DQOs), including the Measurement Quality Indicators (MQIs)—precision, accuracy, representativeness, comparability, completeness, and sensitivity (namely PARCCS parameters) —and sample-specific RLs are dictated by the data quality objectives, project requirements, and intended uses of the data. For this project, the analytical data must be of sufficient technical quality to determine whether contaminants are present and, if present, whether their concentrations are greater than or less than applicable screening criteria based on protection of human health and the environment.

The quality of data generated through this RI will be assessed against the MQIs set forth in this QAPP. Specific QC parameters associated with each of the MQIs are summarized in Table A-1. Specific MQI goals and evaluation criteria (i.e., MDLs, RLs, percent recovery (%R) for accuracy measurements, relative percent difference (RPD) for precision measurements, are defined in Tables A-2 and A-3 for soil and groundwater, respectively. Definitions of these parameters and the applicable QC procedures are presented below.

2.4.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared with their average values. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples and laboratory control samples/laboratory control sample duplicate (LCS/LCSD) for organic analysis and through laboratory duplicate samples for inorganic analyses.

Analytical precision is quantitatively expressed as the relative percent difference (RPD) between the LCS/LCSD, MS/MSD, or laboratory duplicate pairs and is calculated with the following formula:

$$RPD\ (\%) = 100 \times \frac{|S - D|}{(S + D)/2}$$

where:

S = analyte concentration in sample
D = analyte concentration in duplicate sample

Analytical precision measurements will be carried out at a minimum frequency of 1 per 20 samples for each matrix sampled, or one per laboratory analysis group. Laboratory precision will be evaluated against laboratory quantitative RPD performance criteria as defined in Tables A-2 and A-3 for specific analytical methods and sample matrices. If the control criteria are not met, the laboratory will supply a justification of why the limits were exceeded and implement the appropriate corrective actions. The RPD will be evaluated during data review and validation. The data reviewer will note deviations from the specified limits and will comment on the effect of the deviations on reported data.

2.4.2 Accuracy

Accuracy measures the closeness of the measured value to the true value. The accuracy of chemical test results is assessed by "spiking" samples with known standards (surrogates, blank spikes, or matrix spikes) and establishing the average recovery. Accuracy is quantified as the %R. The closer the %R is to 100%, the more accurate the data.

Surrogate recovery will be calculated as follows:

$$\text{Recovery}\ (\%) = \frac{MC}{SC} \times 100$$

where:

SC = spiked concentration
MC = measured concentration
MS percent recovery will be calculated as follows:

$$\text{Recovery}\ (\%) = \frac{MC - USC}{SC} \times 100$$

where:

SC = spiked concentration
MC = measured concentration
USC = unspiked sample concentration

Accuracy measurements on MS samples will be carried out at a minimum frequency of 1 in 20 samples per matrix analyzed. Blank spikes will also be analyzed at a minimum frequency of 1 in 20 samples (not including QC samples) per matrix analyzed. Surrogate recoveries for organic compounds will be determined for each sample analyzed for respective compounds. Laboratory accuracy will be evaluated against the performance criteria defined in Tables A-2 and A-3. If the control criteria are not met, the laboratory will supply a justification of why the limits were exceeded and implement the appropriate corrective actions. Percent recoveries will be evaluated during data review and validation, and the data reviewer will comment on the effect of the deviations on the reported data.

2.4.3 Representativeness

Representativeness measures how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the matrix sampled. The FSP sampling techniques and sample handling protocols (e.g., homogenizing, storage, preservation, and use of duplicates and blanks) have been developed to ensure representative samples. Only representative data will be used in the RI/FS. Exploration locations and field sampling procedures for RI/FS activities on the upland portion of the Site are described in Section 3 of this SQAPP.

The representativeness of a data point is determined by assessing the integrity of the sample upon receipt at the laboratory (e.g., consistency of sample ID and collection date/time between container labels and chain of custody forms, breakage/leakage, cooler temperature, preservation, headspace for VOA containers, etc.); compliance of method required sample preparation and analysis holding times; the conditions of blanks (trip blank, rinsate blank, field blank, method/preparation blank, and calibration blank) associated with the sample; and the overall consistency of the results within a field duplicate pair.

2.4.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. This goal will be achieved through the use of standard techniques to collect samples, USEPA-approved standard methods to analyze samples, and consistent units to report analytical results. Data comparability also depends on data quality. Data of unknown quality cannot be compared.

2.4.5 Completeness

Completeness is defined as the percentage of measurements made that are judged to be valid. Results will be considered valid if the precision, accuracy, and representativeness objectives are met and if RLs are sufficient for the intended uses of the data. Completeness is calculated as follows:

$$Completeness\ (\%) = \frac{V}{P} \times 100$$

where:

V = number of valid measurements
P = number of measurements taken

Valid and invalid data (i.e., data qualified with the R flag [rejected]) will be identified during data validation. The target completeness goal for this project is 95%.

2.4.6 Sensitivity

Sensitivity depicts the level of ability an analytical system (i.e., sample preparation and instrumental analysis) of detecting a target component in a given sample matrix with a defined level of confidence. Factors affecting the sensitivity of an analytical system include: analytical system background (e.g., laboratory artifact or method blank contamination), sample matrix (e.g., mass spectrometry ion ratio change, co-elution of peaks, or baseline elevation), and instrument instability.

2.5 Special Training Requirements/Certifications

All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet the Occupational Safety and Health Administration regulations.

2.6 Documentation and Records

This project will require central project files to be maintained at Aspect. Project records will be stored and maintained in a secure manner. Each project team member is responsible for filing all necessary project information or providing it to the person responsible for the filing system. Individual team members may maintain files for individual tasks, but must provide such files to the central project files upon completion of each task. Hard copy documents will be kept on file at Aspect or at a document storage facility throughout the duration of the project, and all electronic data will be maintained in the database at Aspect.

2.6.1 Field Records

All field activities will be recorded in a project field logbook maintained by the Field Coordinator. The field logbook will include a general description of all sampling activities, results of discussions associated with field sampling activities, sampling personnel, site visitors, and weather conditions. The field logbook will also provide a record of all modifications to the procedures and plans outlined in the Draft RI/FS Work Plan and this Upland SQAPP. The field logbook is intended to provide sufficient documentation of data and observations to enable participants to reconstruct events that occurred during the sampling activities.

In addition to the field logbook, the following forms will be used to record pertinent information during the sampling activities:

- Field Boring Log
- Test Pit Log
- As-Built Well Completion Log
- Well Development Record
- Groundwater Sampling Record
- Sample Collection Log
- Investigation-Derived Waste (IDW) Log

Example field forms are provided in Attachment A.

2.6.2 Analytical Records

All activities and results related to sample analysis will be documented at the analytical laboratory. The analytical laboratory will provide analytical results in a data package for each sample delivery group or analysis batch. Each data package will contain all information required for a complete AQ review, including analytical data, method reporting limits and method detection limits; results for all QA/QC checks including blanks, surrogate spikes, internal standards laboratory control samples, matrix spike/matrix spike duplicates; a narrative of any problems or difficulties encountered and the measures taken to correct them; and copies of all laboratory datasheets and logs including chain of custody forms. Data will be delivered in an electronic format to the Aspect data manager, who will be responsible for oversight of data verification and validation and for archiving the final data and data quality reports in the project file. Electronic data deliverables (EDDs) will be compatible with the project database.

2.6.3 Data Reduction

Data reduction is the process by which original data (analytical measurements) are converted or reduced to a specified format or unit to facilitate analysis of the data. Data reduction requires that all aspects of sample preparation that could affect the test result, such as sample volume analyzed or dilutions required, be taken into account in the final result. It is the laboratory analyst’s responsibility to reduce the data, which are subject to further review by the Laboratory Manager, the Project Manager, the QA/QC Manager, and independent reviewers. Data reduction may be performed manually or electronically. If performed electronically, software used must be free from error.

3 Data Generation and Acquisition

To ensure that the data collected under the specifications of this Upland SQAPP achieve an acceptable level of quality, appropriate QA/QC procedures will be followed at all phases of sample collection and analysis. This section presents a summary of the sampling design, a detailed description of the sampling methods and sample handling requirements and a summary of the QA/QC procedures. Depending on field conditions, the sample locations and sampling methods specified in Section 3.2 may be modified in the field if necessary to meet the sampling objectives. Any modifications will be noted in the field logbook and described in the data report prepared to document the sampling activities.

3.1 Sampling Design – Upland Investigation

The data necessary to meet the sampling objectives will be collected through geophysical/topographic surveys and soil and groundwater sampling and analysis. This section presents the sampling design for the upland portion of the RI.

3.1.1 Site Preparation and Utility Locating

A Site reconnaissance will be performed prior to field activities to confirm the location of proposed sampling locations and insure adequate access. Subsequently, a subcontractor will clear vegetation from areas of the Sesko Property, as necessary to access the proposed investigation locations. Most of the vegetation consists of non-native blackberry and scotch broom bushes that can be easily removed with standard construction equipment.

Prior to any subsurface work, underground utilities will be located and marked by a private utility location company in the work area. In addition to traditional methods of locating utilities, the results of geophysical surveys will be used to identify suspected subsurface utilities. The Utility Notification Center (UNC) will also be notified, at least 48 hours before initiation of subsurface work, to locate and mark utilities within right-of-ways surrounding the properties on which the work will occur and within any utility easements in the vicinity of the work area.

After utilities have been located and the final investigation locations are defined, a subcontractor will core the concrete at boring/drilling exploration locations, where present. Many of the boring/drilling explorations will be completed within asphalt, which will be cored by the driller at the time of drilling, or within areas of exposed ground surface, where no surface coring will be necessary. If there are suspected or unknown utilities in the vicinity of a planned exploration, a vacuum truck equipped with an air knife will be used to clear the exploration location to an approximate depth of 6 to 8 feet below ground surface (bgs) before commencing drilling.

3.1.2 Survey

Magnetic, electromagnetic (EM) conductivity, and/or ground-penetrating radar (GPR) surveys will be performed to provide information regarding the presence and location of potential buried features. The primary objective of the geophysical surveys is to evaluate the former gas works operations area and the former ravine for potential buried structures (i.e. piping, tanks, equipment foundations) or anomalous ground conditions that may indicate historical subsurface use (i.e. covered and filled pits) or fill material. This information will be used to focus soil and groundwater investigations to likely source areas. The geophysical surveys will include all accessible portions of the McConkey and Sesko properties; however, all methods are unlikely to be successful over the entire area so certain geophysical methods may be conducted for specific areas that are not accessible by other methods. For example, GPR is unlikely to be a feasible geophysical survey method for the Sesko Property because of the uneven ground surface and amount of vegetation. Magnetic and EM surveys do not require contact with the ground surface and are, therefore, more likely to be successful on the Sesko Property.

Geophysical survey results will be shared with EPA to determine if adjustments to subsequent investigation steps are warranted. Example adjustments may be moving exploration locations or adding explorations to investigate subsurface anomalies, if identified. Any adjustments to the investigation program will be approved by the EPA RPM.

A supplemental topographic survey will be conducted to accurately locate and document Site features and ground surface elevations across the McConkey and Sesko properties where topographic data does not currently exist. The survey will be completed by a licensed surveyor. Survey data will be provided in hard copy and CAD format. The survey datum will be the nearest city datum to be consistent with the existing bathymetric survey.

3.1.3 Shallow Soil Investigation

During the shallow soil investigation, borings will be completed using the direct-push method and shallow test pits will be excavated using standard construction equipment, operated by a subcontractor. The investigation locations are depicted on Figure A-1 and a soil sampling summary is provided in Table A-4. The location coordinates for the proposed sample locations are summarized on Table A-5. Soil logging and sampling procedures are outlined in Section 3.2.

The shallow soil investigation program will be sequenced as follows:

- Test pit explorations will be conducted to evaluate potential source areas and collect a preliminary set of site chemical data from shallow soils.
- Direct-push soil borings will be advanced to evaluate potential source areas where test pit explorations are not practicable (e.g., beneath buildings) and to complete an approximate minimum 50-foot grid spacing of shallow soil explorations.
- Step-out explorations will be conducted as needed to define the boundaries of contamination exceeding initial preliminary remediation goals (PRGs) in shallow soil.

Each of these steps is described below.

3.1.3.1 Test Pit Explorations

A total of 28 test pits are proposed in the ISA (Figure A-1), as follows:

- Five of the proposed test pits will be completed near the top of the shoreline bluff to evaluate the nature and quality of the shoreline fill material.

- Twelve test pits will be completed to evaluate subsurface conditions in areas of the former gas works operations area where fuels, byproducts and finished gas were stored and at the edge of the operations area where fill materials may have been deposited on the western side of the ravine fill area.
- One test pit will be located in the vicinity of the gas distribution piping and Drip Tank on the southern portion of the McConkey Property.
- Ten test pits are located along the former stormwater and petroleum product piping alignments and throughout the ravine fill area (Figure A-1).

Test pit explorations will be completed to total depths of approximately 6 feet. If fill materials are observed at the target depth, test pits may be extended deeper if soil conditions allow. If concrete or debris prevents reaching the intended exploration depth, the test pit exploration will be relocated one time within a five-foot radius of the original location. If refusal is met a second time, the exploration location will be abandoned and alternative investigation methods will be evaluated.

Soils from test pits will be logged and screened for evidence of contamination, and selected samples will be collected for chemical analysis, as described in Section 3.2.3. A summary of samples to be submitted for chemical analysis is provided in Table A-4.

Following sample collection and field logging, each test pit will backfilled with soil excavated from it. Most of the proposed test pit investigation locations are located in areas where the ground surface is bare ground covered by small, surface vegetation. The test pits excavated in asphalt or concrete areas on portions of the McConkey Property will be asphalted following completion of the field investigation.

Test pit soil logs, an exploration location map, and preliminary (pre-validated) chemical data will be provided to EPA for discussing if any adjustments to the scope of subsequent planned investigation activities are warranted. Any adjustments to the investigation program will be approved by the EPA RPM.

3.1.3.2 Direct-Push Borings

A total of 30 direct-push borings will be completed in the ISA (Figure A-1), as follows:

- Twenty-five direct-push borings are proposed in the former gas works operations area on the McConkey Property. Five of these borings will be completed within the existing building on the southwest corner of the McConkey Property, where a former tar pit was reportedly located.
- Five direct-push borings are proposed surrounding the former bulk petroleum storage area on the Sesko Property.

Direct-push soil borings will be advanced to total depths of 16 feet or to refusal if due to dense soils. If refusal is encountered within fill material (e.g., on buried debris) before the target depth is reached, the boring will be relocated one time within a five-foot radius of the original location. If refusal is met a second time, the exploration location will be abandoned and alternative investigation methods will be evaluated.

Soils from direct-push borings will be logged and screened for evidence of contamination, and selected samples will be collected for chemical analysis, as described in Section 3.2.3. A summary of samples to be submitted for chemical analysis is provided in Table A-4.

Following sample collection and field logging each boring will be backfilled with bentonite chips placed from the total depth of each boring to the ground surface. The ground surface will be patched with concrete or asphalt, or left as bare ground, to match the surrounding surface.

Boring logs, an exploration location map, and preliminary (pre-validated) chemical data collected during the direct-push investigation will be provided to EPA for discussing if any step-out explorations to bound the extent of contamination or if any other adjustments to the scope of subsequent planned investigation activities are warranted. Any adjustments to the investigation program will be approved by the EPA RPM.

3.1.3.3 Step-Out Explorations (If Needed)

This task will be conducted if chemical data or field observations (e.g., observations of NAPL) indicate that additional explorations are required to bound the extent of contamination in shallow soil. The locations, type of exploration, and chemical analysis program will depend on the specific data needs identified.

Exploration logs, an exploration location map, and preliminary (pre-validated) chemical data collected during the step-out investigation will be provided to EPA for discussing whether study objectives have been met.

3.1.4 Deep Soil and Groundwater Investigation

The deep soil and groundwater investigation will consist of the advancement of borings using either Sonic or hollow-stem auger drilling methods for observation and documentation of soil types and aquifers and aquitards, collection of soil samples for physical and chemical analysis, and construction of monitoring wells. The specific exploration locations for the deep soil and groundwater investigation are depicted on Figure A-2. A soil sampling summary is provided on Table A-6. The location coordinates for the proposed sample locations are summarized on Table A-5. A groundwater sampling summary is provided on Table A-7. Soil logging and soil and groundwater sampling procedures are outlined in Section 3.2.

3.1.4.1 Investigation Approach

The total depth of borings advanced for the deep soil and groundwater investigation will be dependent on the field observations made at the time of drilling. Three initial deep borings (MW-101-X, MW-102-X and MW-103-X) will be advanced to characterize subsurface lithology and identify water-bearing units and aquitards. The specific approach for the deep soil and groundwater investigation is as follows:

Define the vertical extent of the water-table aquifer. Borings will be advanced until a suspected aquitard/confining layer, or bedrock, is encountered. If neither a suspected aquitard/confining layer or bedrock is encountered above a depth of 80 feet bgs, the boring will be terminated at 80 feet or 20 feet below the deepest indication of contamination, whichever is deeper.

Evaluate the physical characteristics of the water-table aquifer. Representative soil samples will be collected from the water-bearing unit that comprises the water-table aquifer for physical testing of grain size, density, porosity and total organic carbon content.

Define the extent of soil contamination. Field screening will be conducted and soil samples will be collected for chemical analysis from the ground surface to a total depth corresponding to either: 1) 20 feet below the deepest indication of contamination based on field screening; 2) 10 feet into a suspected aquitard, if no indications of contamination are identified within that unit; or 3) bedrock.

Evaluate the physical characteristics of the aquitard. If encountered, collect representative soil samples from the suspected aquitard below the water-table aquifer for physical testing of grain size, density, porosity and total organic carbon.

Evaluate for the presence of a second, deeper aquifer. Borings will be advanced into a suspected aquitard for a maximum of 20 feet. If there are no indications of a second, deeper aquifer, and there are no indications of contamination in the aquitard based on field screening, the borings will be abandoned and backfilled with no further vertical exploration.

Evaluate the physical characteristics of a second, deeper aquifer. If encountered, representative soil samples will be collected from the deeper aquifer for physical testing of grain size, density, porosity and total organic carbon content.

Define the extent of groundwater contamination. Field observations will be used to identify water-bearing units and aquitards at the Site, as described in previous bullets. Monitoring wells will be installed with screened intervals at variable depths to characterize the groundwater quality throughout the water-table aquifer, as appropriate, and in deeper water bearing zone(s), if encountered and applicable.

Based on the field observations made during the drilling of borings MW-101-X, MW-102-X and MW-103-X, additional deep borings will be advanced to meet the objectives of the deep soil and groundwater investigation. Monitoring wells will be constructed in the deep borings to characterize the groundwater quality and hydraulic characteristics of the water-bearing zones, as discussed in the following sections.

Soil and groundwater samples will be collected from borings/wells during the deep soil and groundwater investigation for chemical analysis, as described further in Sections 3.2.3 and 3.2.4.

3.1.4.2 Well Installation

Monitoring wells will be constructed by a state-licensed, resource protection well driller and in accordance with Chapter 173-160 WAC. An Aspect field geologist will oversee and document installation of each monitoring well, including completion of an As-Built Well Completion Diagram.

Well casing diameter, screen length and total depth are dependent on the purpose of the well and the lithology observed during the investigation activities. The general design and construction of the wells will follow Standard Practice for Design and Installation of

Ground Water Monitoring Wells in Aquifers, ASTM Standard D-5092 (ASTM, 2010), and Minimum Standards for Construction and Maintenance of Wells, Chapter 173-160 WAC (WAC, 2008).

Based on the previous investigation data, groundwater at the shallowest water table is present at a depth of approximately 30 to 35 feet bgs (relative to the ground surface of the McConkey Property). The water table wells will be constructed to appropriately characterize this shallowest water-bearing zone, with 10- to 15-foot screens constructed across the top of the water table. The screened interval for water table wells is estimated to be between 30 and 45 feet bgs. However, the final well construction details will be determined in the field based on the results of field observations. If an aquitard is encountered at a depth shallower than 45 feet bgs, the water table wells may be constructed with a shorter and/or shallower screened interval.

The screen length, location and total depth for deep wells will be determined based on field observations of lithologic units and groundwater occurrence, in accordance with the following decision criteria:

Deep monitoring wells will be constructed at borings MW-101-X, MW-102-X and MW-103-X to characterize the vertical extent of contamination in the shallow water-bearing zone. The wells will either be constructed with screens set at the base of the water-bearing zone/top of an identified aquitard, or at a set vertical distance beneath the water table or deepest indication of contamination.

If an aquitard is identified, the deep wells will be constructed with a 10-foot screen constructed at the base of the shallow water-bearing zone/top of the aquitard.

If no aquitard is identified at a depth shallower than 80 feet bgs, the wells will be constructed with a 10-foot screen with the top of the screen at a depth corresponding to 20 feet below the deepest indication of contamination.

If no aquitard and no contamination are observed in the boring, the deep well will be completed with the top of the 10-foot screen installed 20 feet below the bottom of the screen of the nearest water table well. For example, if the nearest water table well is constructed with a screen set from 35- to 50 feet bgs; the deep well will be constructed with a screen set from 70- to 80 feet bgs.

Five perimeter borings will be installed along the boundaries of the upland ISA and completed as water-table monitoring wells (MW-9WT through MW-14WT; Figure A-2). The purpose of these explorations is to evaluate the extent of contamination in soil and groundwater at the upper saturated zone.

Based on the results of the shallow soil investigation, four interior borings, to be located within the boundaries of the upland ISA, are planned for advancement and completion as monitoring wells (MW-15WT through MW-19WT) to characterize groundwater in the vicinity of identified sources of contamination. The locations and actual number of interior borings will be determined in consultation with EPA after the shallow soil investigation is completed.

The monitoring wells will be constructed with 2-inch-diameter threaded Schedule 40 PVC slotted screen and blank casing. Well screens will be 0.010-inch (10 slot) slotted screen. An artificial filter pack consisting of 10/20 silica sand will be placed around the well screen, and an annular seal consisting of bentonite chips will be placed above the filter pack. A concrete surface seal will be set at grade for each new monitoring well. The finished monitoring wells will be protected with a steel flush-mount monument, or steel above-ground monument, embedded in the concrete surface seal.

Groundwater samples from Site monitoring wells will be collected and analyzed as described in Section 3.2.4. Groundwater monitoring data will be evaluated to determine if study objectives, including identifying the extent of contamination, may have been achieved, or if additional explorations may be needed.

3.1.4.3 Well Development

Following installation, each new monitoring well will be developed to remove fine-grained material from inside the well casing and filter pack to the extent practical, and to improve hydraulic communication between the well screen and the surrounding water-bearing formation. Depth to water will be measured at start and end of development. The wells will be developed using an inertial pump and surge block by performing surge and pump cycles until the water is substantially clear. Surging over the length of the screened interval will be performed for a set period of time or a minimum of 10 surges. The well will then be pumped until the water clears significantly. These surge and pump cycles will be repeated until the water is substantially clear shortly after the start of pumping or until a maximum of 15 casing volumes of water has been removed.

3.1.5 Hydrogeologic Testing

Hydrogeologic testing and evaluation will be conducted in a subset of monitoring wells in each water-bearing zone to determine the hydraulic conductivity of aquifer units and evaluate the influence of tidal fluctuation on groundwater levels. The procedures for slug test performance and data analysis are presented in Section 3.2.5.1. The procedures for tidal study data collection and analysis are presented in Section 3.2.5.2.

3.2 Sampling Methods

3.2.1 Exploration and Sample Identification

All samples will be assigned unique identification codes based on a designation scheme designed to suit the needs of the field personnel, data managers and data users.

Soil explorations that are not completed as monitoring wells will consist of either "SB" for soil boring or "TP" for test pit, followed by a sequential exploration number. Each soil sample collected for analysis will be assigned a unique sample identification number including the exploration number and the depth from which the sample was collected. For example, the soil sample collected from boring SB-20 at a depth of 7 to 8 feet bgs would be identified as SB-20-7-8.

The monitoring wells will be identified with a sequential well identification number, beginning with MW-9 for the water-tables wells and MW-101 for deeper wells. An identification suffix for each well will indicate the water-bearing zone in which the well is constructed. Water-table wells will be indicated by a "WT," for example, the location name for water-table well MW-9 would be "MW-9WT." The identification suffix for deeper wells will indicate the screen depth. For example, the location name for well MW-101, which is constructed with the bottom of the screen set at 80 feet bgs would be "MW-101-80." Each groundwater sample will be assigned a unique sample identification number that includes the well number and the 8-digit date on which the sample was collected. For example, a groundwater sample collected from monitoring well MW-101-X on May 30, 2015, would be identified as MW-101-X-053015.

3.2.2 Location Positioning

Horizontal coordinates for each soil sampling location will be recorded using a hand-held global positioning system (GPS) instrument with real-time differential correction. The horizontal coordinates and elevations of monitoring wells included in the assessment will be surveyed by a licensed surveyor relative to a common horizontal and vertical datum. Monitoring well top-of-casing elevations will be surveyed to the nearest 0.01 foot, and horizontal coordinates to the nearest 0.1 foot, or better. Each well will be surveyed at the marked spot on the top of the PVC well casing from which depth-to-water measurements are collected.

3.2.3 Soil Data Collection

Soil samples will be collected from direct-push borings and test pits during the shallow soil investigation and from deep borings during the deep soil and groundwater investigation. A geologist from Aspect will oversee the drilling and excavation activities and prepare a geologic boring or test pit log for each of the explorations completed. The field representative will visually classify the soils in accordance with ASTM Method D 2488 and record soil descriptions, field screening results, and other relevant details (e.g., staining, debris, odors, etc.) on the appropriate field form. If samples are collected for chemical analysis, the sample ID and depth will also be recorded on the log.

In addition to soil classification, the field representative will screen the soil using a photoionization detector (PID) to monitor for the presence of volatile organic compounds (VOCs). The PID will be calibrated daily in the field using the manufacturer's calibration standard (100 ppm isobutylene gas). A calibration test, referred to as a "bump test", will be performed as necessary in the field using the calibration gas to check that the PID remains properly calibrated throughout the day.

Soil samples will also be field-screened for presence of petroleum using visual examination and water sheen tests. The following qualitative nomenclature for oil on soil samples will include:

- *No visible evidence.*
- *Sheen* – Sheen as described by the sheen testing nomenclature described below.
- *Staining* – Visible brown or black stating on soil. Can be visible as mottling or in bands. Typically associated with fine-grained soils.
- *Coating* – Visible brown or black oil coating soil grains. Typically associated with coarse-grained soils.

- *Oil Wetted* – Visible brown or black oil wetting the soil sample. Oil appears as a liquid and is not held by soil grains. Soils oozing petroleum typically contain approximately 2 to 3 percent petroleum.

Water sheen tests are conducted by placing a small aliquot of soil (about a tablespoon) into a cup or tray containing water, gently shaking, and watching for presence of petroleum sheen. Care will be taken to differentiate sheen created by petroleum (iridescent swirl of colors, does coalesce after being disturbed) versus other organic matter (angular "waxy" sheets", do not coalesce after being disturbed), and recording the information appropriately. The perceived magnitude of petroleum sheen (slight, moderate, heavy) will be recorded with corresponding odors if observed.

All soil samples to be submitted for VOC analyses will be collected in accordance with U.S. Environmental Protection Agency (EPA) Method 5035A. The soil aliquot for VOC analysis will be collected from the undisturbed soil sample core using a laboratory-supplied modified disposable plastic syringe as required by the EPA Method 5035A, and placed in pre-weighed laboratory supplied vials. For all other analyses, the soil samples will be removed from the sampler using a decontaminated stainless steel spoon or a freshly-gloved hand. Gravel-sized material greater than approximately 0.5 inch will be removed from the sample during mixing. A representative aliquot of the homogenized soil will be placed into certified-clean jars supplied by the analytical laboratory.

The soil analytical data collection program is presented on Tables A-4 and A-6. Samples will be submitted for chemical analysis as follows:

- Selected samples from all explorations will be submitted for analysis of polycyclic aromatic hydrocarbons (PAHs) and VOCs to define the magnitude and extent of contamination. Preliminary targeted depth intervals are provided on Tables A-4 and A-6. Actual depth intervals will be selected based on field indications of contamination and observations of lithology and groundwater occurrence. Soil layers exhibiting evidence of contamination or potential pathways for contaminant migration will be targeted for sampling.
- A subset of soil samples collected during the initial investigation will be submitted for analysis of semivolatile organic compounds (SVOCs), cyanide, metals, pesticides and PCBs to evaluate the potential occurrence of other COPCs. Preliminary targeted locations and depth intervals are provided on Table A-4. Actual depth intervals will be selected based on field indications of contamination.
- Representative samples of each distinct geologic unit identified at the Site will be collected and submitted for physical property testing, including total organic carbon, grain size, moisture content, and Atterberg limits (for fine-grained soils). Sample locations will be determined in the field based on observed geology at deep borings.
- Selected samples exhibiting evidence of petroleum contamination may be submitted for petroleum hydrocarbon identification by HCID, to assist in source evaluation and characterization.
- Analytes targeted in subsequent sampling will depend on the results of shallow soil sampling and source characterization. An initial screening of detected analytes

compared to initial PRGs will be conducted in consultation with EPA to determine appropriate analyses for subsequent investigations.

The method, container, and preservation requirements for each laboratory analysis are provided on Table A-8. QC soil samples (e.g., field duplicates, rinsate blanks, and trip blanks) will be collected at the respective frequencies prescribed in Section A3.5 of the QAPP.

3.2.4 Groundwater Data Collection

Groundwater samples will be collected from the monitoring wells and handled in accordance with the procedures described below:

The locking well cap will be removed and the depth-to-groundwater will be measured from the surveyed location to the nearest 0.01 foot using an electronic water level measuring device. The depth to the bottom of the monitoring well will also be measured to evaluate siltation of the monitoring well. The water level indicator will be decontaminated between wells.

Each monitoring well will be purged at a low-flow rate less than 0.5 liter per minute (Puls and Barcelona, 1996) using a dedicated electric submersible or bladder pump. The tubing intake will be placed just below the center of the saturated section of well screen. During purging, field parameters (temperature, pH, specific electrical conductance, dissolved oxygen, and oxidation-reduction potential [ORP]) will be monitored using a YSI meter and flow-through cell, or equivalent. These field parameters will be recorded at 3-minute intervals throughout well purging until they stabilize. Stabilization is defined as three successive readings where the parameter values vary by less than 10% (or 0.5 milligrams per liter [mg/L] dissolved oxygen if the readings are below 1 mg/L). However, no more than three well casing volumes will be purged prior to groundwater sample collection. Three turbidity measurements will also be made before collecting the sample (Hach 2100Q turbidimeter).

Samples with a field-measured specific electrical conductance greater than 1,000 μS/cm or turbidity greater than 25 nephelometric turbidity units (NTU) will be denoted as such on the chain of custody form, so that the laboratory can employ appropriate sample preparation techniques).

If the monitoring well is completely dewatered during purging, samples will be collected when sufficient recharge has occurred to allow filling of all sample containers.

Once purging is complete, the groundwater samples will be collected using the same low-flow rate directly into laboratory-supplied sample containers. Samples for dissolved metals analyses will be field filtered using an in-line 0.45 μm filter; at least 0.5 liter of water will be purged through the filter prior to sample collection.

QC groundwater samples (e.g., field duplicates and trip blanks) will be collected at the respective frequencies prescribed in Section 3.5.

Following sampling, the wells cap and monument cap will be secured. Each well's dedicated tubing will be retained in a labeled Ziploc bag for subsequent sampling events. Any damaged or defective well caps or monuments will be noted and scheduled for replacement, if necessary.

The groundwater analytical data collection program for the first groundwater sampling event is presented on Table A-7. The method, container, and preservation requirements for each laboratory analysis are provided on Table A-8. QC groundwater samples (e.g., field duplicates, rinsate blanks, and trip blanks) will be collected at the respective frequencies prescribed in Section 3.5 of the QAPP.

The data collection for the RI/FS will include at least four consecutive quarterly groundwater monitoring and sampling events. The first event will include chemical sampling of all existing and newly installed monitoring wells and analysis of groundwater samples for all of the groundwater COPCs (VOCs including benzene, toluene, ethylbenzene, and xylenes [BTEX], SVOCs including PAHs, cyanide, and metals: see Table A-7). A subset of wells will also be analyzed for natural attenuation parameters (dissolved organic carbon, nitrate, nitrite, sulfate, sulfide, ferrous iron, dissolved managanese, and alkalinity) as noted in Table A-7. Following the first event, the soil and groundwater data will be reviewed collectively to determine the scope of work for additional sampling events. The scope and frequency of subsequent groundwater monitoring will be determined in consultation with EPA.

3.2.5 Hydrogeologic Data Collection

3.2.5.1 Hydraulic Conductivity Testing

A common method of in situ estimation of the hydraulic conductivity is the slug test. This method consists of quickly lowering or raising the water level in a well or borehole from equilibrium and measuring its subsequent rate of rise or fall, respectively. The slug test method is an efficient, cost-effective method to estimate the hydraulic conductivity of the hydrogeologic unit in which a particular well is completed.

3.2.5.1.1 Field Procedures

Prior to slug testing, the wells will be fully developed. Any wells where the turbidity exceeds 50 NTUs will be redeveloped.

The slug tests produce a change in water level within a well and measure the rate of return to the static water level. This rate of water level change in the well is used to compute the hydraulic conductivity of the water bearing zone. Depending on the location of the monitoring well screen relative to the water table, either a slug bar or a pneumatic slug apparatus will be used to induce a water level change in the well. For monitoring wells with unsaturated or partially saturated screens, wells where the water table is less than 3 feet above the top of the screen, or for wells where the casing will not hold pressure; a slug bar of known volume will be used to displace water. For monitoring wells with fully saturated screens where the water level is greater than 3 feet above the top of the screen; a pneumatic slug apparatus will be used to displace water. For either test method, the displacement volume (size of the slug bar or the operating pressure of the pneumatic apparatus) will be chosen based on the expected hydraulic conductivity of the screened aquifer interval.

To test the results for dependency of hydraulic head, slug tests will be performed using a minimum of two different displacement volumes at each well. To test for repeatability, a minimum of two slug tests will be performed at each displacement volume.

3.2.5.1.2 Slug Bar Testing Methods

Slug bars will be one inch in diameter to allow passage of the transducer cable inside a standard 2 inch diameter well casing. Slug bar lengths of 1.3, 2.6, or 5.0 feet will be used to produce approximately 0.5, 1.0, or 2.0 feet of displacement in a 2 inch monitoring well; respectively.

The water level in the well will be measured using a vented pressure transducer (5 or 15psi range) and collected electronically on a data logger set to a nearly continuous time interval (0.1 second data logging frequency). Manually collected water level measurements, taken periodically throughout the test with a water level indicator, will be used to confirm results collected from the pressure transducer. Prior to the testing, the pressure transducer will be installed to avoid contact with the slug bars. Once the transducer is in place and the data logger is programmed, the slug bar will be lowered on a line until it is just above water — as evidenced by change in monitored pressure reading when bottom of slug bar enters water or by a level indicator lowered with the slug.

Falling Head Test. To initiate the falling head test, the slug bar will be dropped into the groundwater so it is fully submerged. The insertion should be done quickly, and with care taken not to disturb the pressure transducer. Water in the well will rapidly rise, then slowly fall to meet the initial static water level over time. The pressure will be monitored to confirm initial displacement was relatively instantaneous compared to the response. When the pressure transducer indicates that water levels have recovered 80% (for low-K formations) to 95% (for high-K formations) of the initial displacement, the test will be concluded, at which time the water level will be confirmed manually.

Rising Head Test. At the completion of the each falling head test, the slug bar is fully submerged and the water level has returned to near static conditions. The rising head test will be initiated at this time by quickly raising the slug bar will completely out of water without disturbing the pressure transducer. Water in the well will rapidly fall and then rise to meet the initial static water level over time. The pressure will be monitored to confirm initial displacement was relatively instantaneous compared to the response. When the pressure transducer indicates that water levels have recovered 80% (for low hydraulic conductivity formations) to 95% (for high hydraulic conductivity formations) of the initial displacement, the test will be concluded, at which time the water level will be confirmed manually.

3.2.5.1.3 Pneumatic Testing Methods

The pneumatic slug apparatus creates an airtight seal with the well casing and uses compressed nitrogen to displace water in the well casing. The apparatus consists of the following items:

- 22 cubic foot compressed nitrogen bottle with primary regulator and secondary 0-10 psi low pressure regulator; and
- PVC wellhead assembly with pressure relief valve, analog pressure gauge (0-100 inches of water range), pressure transducer cable compression fitting, and flexible rubber PVC coupling.

Similar to the slug bar testing method, the water level in the well will be measured using a vented pressure transducer (5 or 15psi range) and collected electronically on a data logger set to a nearly continuous time interval (0.1 second data logging frequency).

Rising Head Test. The pneumatic slug test is initiated by closing the pressure relief valve and slowly adjusting the low pressure regulator to the desired pressure (displacement). Pressures of 6, 12, and 24 inches of water correspond to water level displacements of approximately 0.5, 1.0, or 2.0 feet; respectively. As the headspace in the well is being pressurized and the water level is equilibrating, the pressure transducer will read an elevated pressure. Following equilibration of the water level, the pressure transducer reading will be consistent with pre-test readings. After the transducer readings have stabilized, the pressure relief valve is then opened quickly to allow the water level in the well to return to static conditions. The valve should be opened quickly without disturbing the pressure transducer. When the pressure transducer indicates that water levels have recovered 80% (for low hydraulic conductivity formations) to 95% (for high hydraulic conductivity formations) of the initial displacement, the test will be concluded.

Falling Head Test. The pneumatic slug testing apparatus does not support falling head slug testing. The initial pressurization of the well casing is functionally equivalent to a falling head test. Equilibration time is dependent on hydraulic conductivity, and the equilibration time of a given pressure (displacement) will be equivalent to the recovery time for a rising head test.

3.2.5.1.4 Data Analysis

The recovery data of the slug tests will be used to estimate the hydraulic conductivity of the formation adjacent to screened interval of each monitoring well through the comparison of theoretical models. Theoretical models such as Hvorslev (1951), Cooper et al. (1967), Bouwer and Rice (1976), and Dagan (1978) will be used for typical water level recovery curves. In the event that inertial effects or oscillatory water level responses are observed, the theoretical model of Springer-Gelhar (1991) shall be used when applicable in high hydraulic conductivity formations. The appropriate model for each well will be determined after data is plotted and inspected. The use of a curve-matching computer software program may be used for effective analysis. Potential well skin effects will be assessed using methods described in Butler (1996).

3.2.5.2 Tidal Study

A tidal study will be conducted to evaluate effects of tidal fluctuations on nearshore groundwater levels, and thus flow direction, throughout the tidal cycle. The tidal study will involve collection of continuous water level measurements over a 72- to 96-hour period at select monitoring wells. The tidal study will include wells screened at the water table and in all deeper water-bearing zones that are identified and in which wells are constructed. Where present, monitoring wells located at varying distances from the shoreline along a flow path will be used in the tidal study to evaluate tidal influence on groundwater with distance from the shoreline.

Each of the wells will be equipped with a downhole pressure transducer/data logger to allow automated collection of water level data at 5-minute intervals. A data logger will also be placed in the Port Washington Narrows to directly record tidal fluctuations. A barometric pressure data logger will also be installed to allow water level data to be corrected for changes in atmospheric pressure throughout the study. During installation of the data loggers, a manual depth-to-water measurement will be collected in each well when the data logger takes its first reading, and again at the end of the test prior to removing the logger. The depth-to-water measurements (below surveyed top of well casing) provide groundwater elevations which will be used to convert the data logger readings into groundwater elevations. A round of concurrent water level measurements will also be collected in all upland wells during the tidal study.

The tidal data from each well will be analyzed using the method of Serfes (1991) to derive a tidally-averaged groundwater elevation for the study period. The data from the wells will be used to assess the net (tidally averaged) groundwater flow direction and hydraulic gradients. Aquifer hydraulic conductivity will be estimated from the tidal study data using the stage ratio and time lag methods of Ferris (1963).

3.3 Sample Handling Requirements

This section addresses the sampling program requirements for field decontamination, investigation-derived waste management, sample custody, and sample shipping requirements.

3.3.1 Sample Handling Procedures

Soil and groundwater samples collected for chemical analysis will be placed in appropriately sized, laboratory prepared, pre-cleaned, labeled sample containers and capped with Teflon®-lined lids (Table A-8).

Each sample label will contain the project name, sample ID, preservation technique (where applicable), date and time of collection, and the initials of the person(s) preparing the sample. A completed sample label will be affixed to each sample container.

3.3.2 Decontamination Procedures

All non-disposable sampling equipment (stainless steel spoons and bowls) will be decontaminated before collection of each sample. The decontamination sequence consists of a scrub with a non-phosphate (Alconox) solution, followed by tap water (potable) rinse, and finished with thorough spraying with deionized or distilled water. A solvent rinse – methanol or hexane – may be used to remove petroleum product from sampling equipment prior to the decontamination procedure described above.

3.3.3 Field-generated Waste Disposal

The investigation and sampling methods described in this SQAPP will generate the following investigation-derived waste (IDW):

- Soil and drilling cuttings
- Groundwater (development and purge water)
- Decontamination water
- Personal protective equipment (PPE)

- Disposable sampling equipment (dedicated samplers, tubing, etc.)

All IDW will be segregated by media (soil/solid, liquid, and refuse [PPE and disposables]) and placed in labeled Washington State Department of Transportation (DOT)-approved drums pending the analytical results to determine appropriate disposal. Each drum will be labeled with the following information:

- Non Classified IDW
- Content of the drum (soil, water, PPE) and its source (i.e., the exploration[s] from which the contents came);
- Date IDW was generated; and
- Name and telephone number of the contact person.

The drums of IDW will be temporarily consolidated on-site, profiled (in accordance with applicable waste regulations) based on available analytical data, and disposed of appropriately at a permitted off-site disposal facility. Containers of IDW will be on site less than 90 days from date of generation.

Documentation for off-site disposal of IDW will be maintained in the project file.

3.3.4 Shipping Requirements and Chain-of-Custody

Upon collection, samples will be placed upright in a cooler. Ice or blue ice will be placed in each cooler to meet sample preservation requirements. Inert cushioning material will be placed in the remaining space of the cooler as needed to limit movement of the sample containers. If the sample coolers are being shipped, not hand carried, to the laboratory, the chain of custody form will be placed in a waterproof bag taped to the inside lid of the cooler for shipment.

After collection, samples will be maintained in Aspect's custody until formally transferred to the analytical laboratory. For purposes of this work, custody of the samples will be defined as follows:

- In plain view of the field representatives;
- Inside a cooler that is in plain view of the field representative; or
- Inside any locked space such as a cooler, locker, car, or truck to which the field representative has the only immediately available key(s).

A chain of custody record provided by the laboratory will be initiated at the time of sampling for all samples collected. The record will be signed by the field representative and others who subsequently take custody of the sample. Couriers or other professional shipping representatives are not required to sign the chain of custody form; however, shipping receipts will be collected and maintained as a part of custody documentation in project files. A copy of the chain of custody form with appropriate signatures will be kept by Aspect's project manager.

All samples will be shipped or hand-delivered to the analytical laboratory no later than the day after collection. Samples collected on Friday may be held until the following Monday for shipment, provided that this does not jeopardize any hold time requirements. Specific sample shipping procedures are as follows:

- Each cooler or container holding the samples for analysis will be hand-delivered the day of sample collection, couriered, or shipped via overnight delivery to the appropriate analytical laboratory. In the event that Saturday delivery is required, the field coordinator will contact the analytical laboratory before 3 p.m. on Friday to ensure that the laboratory is aware of the number of containers shipped and the airbill tracking numbers for those containers.
- Coolant ice will be sealed in separate plastic bags and placed in the shipping containers.
- Individual samples will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.
- If the samples are transferred using a commercial shipping company, the following procedures will be followed:
  - The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to enable positive identification.
  - The shipping waybill number will be documented on all chain of custody forms accompanying the samples.
  - Chain of custody forms will be enclosed in a plastic bag and placed inside the cooler.
  - A minimum of two signed and dated chain of custody seals will be placed on adjacent sides of each cooler prior to shipping.
  - Each cooler will be wrapped securely with strapping tape, labeled "Glass – Fragile" and "This End Up," and be clearly labeled with the laboratory's shipping address and the consultant's return address.

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the chain of custody form. Upon receipt of samples at the laboratory, the person receiving the sample will sign the chain of custody form. The shipping container seals will be broken (if applicable) and the receiver will record the condition of the samples on a sample receipt form. Chain of custody forms will be used internally in the lab to track sample handling and final disposition.

3.4 Laboratory Methods

This section summarizes the target physical and chemical analyses for the soil and groundwater samples to be collected during the upland portion of the RI. All sample analyses will be conducted in accordance with EPA-approved methods and this Upland SQAPP. Prior to analyses, all samples will be maintained according to the appropriate holding times and temperatures for each analysis (Table A-8). Analytes, analytical methods, and target detection limits for chemical and physical testing are presented in Tables A-2 and A-3.

Chemical/physical testing will be conducted at Friedman & Bruya, Inc. and Analytical Resources, Inc. Both laboratories are accredited under the National Environmental Laboratories Accreditation Program. All chemical and physical testing will adhere to the most recent EPA QA/QC procedures outlined in the approved analytical methods and in this Upland SQAPP. If more current analytical methods are available, the laboratories will use them. The laboratories have provided a list of practical method reporting limits for each analyte of interest, which are summarized on Tables A-2 and A-3.

The analytical methodologies to be employed for the analyses of samples collected during the RI/FS are in accordance with the following documents:

- USEPA SW Methods – USEPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition, December 1996.
- USEPA Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry, Office of Water, U.S. Environmental Protection Agency, August 2002, EPA-821-R-02-019.
- Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 20th Edition, 1995.
- Ecology Analytical Methods for Petroleum Hydrocarbons. Publication No. ECY 97-602. June 1997.

Table A-8 lists the laboratory analytical methods for soil and groundwater analyses to be performed during the RI/FS, along with samples containers, preservation, and analytical holding times for each analysis.

3.5 Quality Assurance/Quality Control

3.5.1 Field Quality Control

Beyond use of standard sampling protocols defined in this Upland SQAPP, field QC procedures include maintaining the field instrumentation used. Field instruments (e.g., PID for evaluating presence of VOCs in soil samples, and the YSI meter for measuring field parameters during groundwater sampling) are maintained and calibrated regularly prior to use, in accordance with manufacturer recommendations.

In addition, field QC samples will be collected and submitted for analyses to monitor the precision and accuracy associated with field procedures. Field QC samples to be collected and analyzed for this RI include field duplicates, trip blanks, and equipment rinsate blanks. The definition and sampling requirements for field QC samples are presented below.

Blind Field Duplicates. Blind field duplicate samples are used to check for sampling and analysis reproducibility; however, the field duplicate sample results include variability introduced during both field sampling and laboratory preparation and analysis, and EPA data validation guidance provides no specific evaluation criteria for field duplicate samples. Advisory evaluation criteria are set forth at 35% for RPD (if both results are greater than 5 times the RL) and 2 times the RLs for concentration difference (if either of the result is less than 5 times the RL) between the original and field duplicate results.

Field Duplicates will be submitted “blind” to the laboratory as discrete samples (i.e., given unique sample identifiers to keep the duplicate identity unknown to the laboratory), but will be clearly identified in the field log. Field duplicate samples will be collected at a frequency of 5% (1 per 20) of the field samples for each matrix and analytical method, but not less than one duplicate per sampling event per matrix.

If a given soil sample depth interval lacks sufficient volume (recovery) to supply material for a planned analysis and its field duplicate analysis, the field duplicate aliquot will be collected for that analysis from another depth interval in that same location if practical.

Trip Blank Samples. Trip blank samples will be used to monitor possible VOC cross contamination occurring during sample transport. Trip blank samples are prepared and supplied by the laboratory using organic-free reagent-grade water into a VOC vial prior to the collection of field samples. The trip blank sample vials are placed with and accompany the VOC and gasoline-range total petroleum hydrocarbon (TPH) samples through the entire transporting process. One trip blank will be collected for each soil sampling round and each groundwater sampling round where VOC or gasoline-range TPH analyses are conducted.

In case a target compound is present in a trip blank, results for all samples shipped with this trip blank will be evaluated and data qualified accordingly if determined that the results are affected.

Equipment Rinsate Blank Samples. Equipment rinsate blanks are collected to determine the potential of cross-contamination introduced by soil sampling equipment that is used between samples. Groundwater sampling is conducted using dedicated equipment; therefore, rinsate blanks are not needed for groundwater sampling QC. The deionized water used for soil sampling equipment decontamination is rinsed through the decontaminated sampling equipment and collected into adequate sample containers for analysis of VOCs, low-level PAHs, and priority pollutant metals The blank is then processed, analyzed, and reported as a regular field sample. One rinsate blank will be conducted for each round of soil sampling. The rinsate blank sampled will be labeled with a “RB-“ prefix and the date it is collected (e.g., RB-053015).

3.5.2 Laboratory Quality Control

The laboratories’ analytical procedures must meet requirements specified in the respective analytical methods or approved laboratory standard operating procedures (SOPs), e.g., instrument performance check, initial calibration, calibration check, blanks, surrogate spikes, internal standards, and/or labeled compound spikes. Specific laboratory QC analyses required for this project will consist of the following at a minimum:

Instrument tuning, instrument initial calibration, and calibration verification analyses as required in the analytical methods and the laboratory standard operating procedures (SOPs);

Laboratory and/or instrument method blank measurements at a minimum frequency of 5% (1 per 20 samples) or in accordance with method requirements, whichever is more frequent; and

Accuracy and precision measurements as defined in Table A-1, at a minimum frequency of 5% (1 per 20 samples) or in accordance with method requirements, whichever is more frequent. In cases where a pair of MS/MSD or MS/laboratory duplicate analyses are not performed on a project sample, a set of LCS/LCSD analyses will be performed to provide sufficient measures for analytical precision and accuracy evaluation.

The laboratory's QA officers are responsible for ensuring that the laboratory implements the internal QC and QA procedures detailed in their Quality Assurance Manual.

3.6 Field Instrument/Equipment Calibration

Maintenance and calibration of instruments used in the field for sampling (e.g., PID for evaluating presence of VOCs in soil samples, and the YSI meter for measuring field parameters during groundwater sampling) will be conducted regularly in accordance with manufacturer recommendations prior to use. The Aspect field coordinator will be responsible for verifying that required maintenance has been performed prior to using equipment in the field. Equipment maintenance and calibration information will be documented in the instrument's calibration log. Detailed information regarding the calibration procedures and frequency of equipment calibration is provided in each specific manufacturers instruction manual.

3.7 Inspection/Acceptance of Supplies and Consumables

Inspection and acceptance of field supplies, including laboratory-prepared sampling bottles, will be performed by the field coordinator. All primary chemical standards and standard solutions used for this project, either in the field or laboratory, will be traceable to documented, reliable commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities found in the standard will be documented.

3.8 Data Management

Daily field records, a combination of field logbooks, field forms and chain of custody forms, will make up the primary documentation for field activities. The daily field records will be checked for completeness and accuracy by the field coordinator. Upon completion of review, hard copy notes and forms will be scanned to create an electronic record of the daily field activities. Information pertaining to sampling locations, dates, depths, equipment and the sample identifiers will be entered into the project database. All manually-entered data will be reviewed and verified by a second party.

Laboratory data will be provided to the Data Manager in the EQuIS electronic format. Laboratory data that is electronically provided and loaded into the database will undergo a check against the laboratory hard copy data. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. The accuracy of all manually-entered data will be verified by a second party. Data tables and reports will be exported from EQuIS to Microsoft Excel tables.

4 Assessments and Response Actions

Once data are received from the laboratory, a number of QC procedures will be followed to provide an accurate evaluation of the data quality. Specific procedures will be followed to assess data precision, accuracy, and completeness.

4.1 Compliance Assessments

Laboratory and field performance audits consist of on-site reviews of QA systems and equipment for sampling, calibration, and measurement. Laboratory audits will not be conducted as part of this study; however, all laboratory audit reports will be made available to the project QA/QC Manager upon request. The laboratory is required to have written procedures addressing internal QA/QC; these procedures have been submitted and will be reviewed by the project QA/QC Manager to ensure compliance with the QAPP. The laboratory must ensure that personnel engaged in sampling and analysis tasks have appropriate training. The laboratory will, as part of the audit process, provide for consultant's review of written details of any and all method modifications planned.

4.2 Response and Corrective Actions

The following paragraphs identify the responsibilities of key project team members and actions to be taken in the event of an error, problem, or nonconformance to protocols identified in this document.

4.2.1 Field Activities

The field coordinator will be responsible for correcting equipment malfunctions during field sampling activities. The project manager will be responsible for resolving situations identified by the field coordinator that may result in non-compliance with the SQAPP. All corrective measures will be documented in the field logbook.

4.2.2 Laboratory

The laboratory is required to comply with their SOPs. The Laboratory Manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.

If routine QC audits by the laboratory result in detection of unacceptable conditions or data, actions specified in the laboratory SOPs will be taken. Specific corrective actions are outlined in each SOP used and can include the following:

- Identifying the source of the violation;
- Reanalyzing samples if holding time criteria permit;
- Resampling and analyzing;
- Evaluating and amending sampling and analytical procedures; and/or
- Accepting but qualifying data to indicate the level of uncertainty.

If unacceptable conditions occur, the laboratory will contact Aspect's project manager to discuss the issues and determine the appropriate corrective action. Corrective actions taken by the laboratory during analysis of samples for this project will be documented by the laboratory in the case narrative associated with the affected samples.

In addition, the project data quality manager will review the laboratory data generated for this investigation to ensure that project DQOs are met. If the review indicates that non-conformances in the data have resulted from field sampling or documentation procedures or laboratory analytical or documentation procedures, the impact of those non-conformances on the overall project data usability will be assessed. Appropriate actions, including re-sampling and/or re-analysis of samples may be recommended to the project manager to achieve project objectives.

4.3 Reports to Management

Corrective actions will be required if deviations from the methods or QA requirements established in this SQAPP are encountered. The project manager will provide assistance in resolving the issue and corrective actions will be taken immediately, if possible. Any issue that ultimately affects the quality of the data, or results in a change of scope in the work described in the SQAPP will be documented in the field logbook. A description of the issue, the attempted resolution, and any effects on data quality or usability will be provided in the data report submittal.

5 Data Validation and Usability

This section describes the processes that will be used to review project quality data.

5.1 Data Review, Validation, and Verification

During the validation process, analytical data will be evaluated for method quality control and laboratory quality control compliance, and their validity and applicability for program purposes will be determined. All data will undergo a 90% Stage 2B and 10% Stage 4 data validation. Based on the findings of the validation process, data validation qualifiers may be assigned. The validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed.

5.2 Validation and Verification Methods

Data validation includes signed entries by the field and laboratory technicians on field data sheets and laboratory datasheets, respectively; review for completeness and accuracy by the FC and Laboratory Manager; review by the Data Manager for outliers and omissions; and the use of QC criteria to accept or reject specific data. All data will be entered into the EQuIS database and a raw data file printed. Ten percent verification of the database raw data file and one hundred percent verification of assigned qualifiers will be performed by a second data manager or designee. Any errors found will be corrected on the raw data printout sheet. After the raw data is checked, the top sheet will be marked with the date the checking is completed and the initials of the person doing the checking. Any errors in the raw data file will be corrected, and the database established.

All laboratory data will be reviewed and verified to determine whether all DQOs have been met, and that appropriate corrective actions have been taken, when necessary. The project QA/QC Manager or designee will be responsible for the final review of all data generated from analyses of samples.

The first level of review will take place in the laboratory as the data are generated. The laboratory department manager or designee will be responsible for ensuring that the data generated meet minimum QA/QC requirements and that the instruments were operating under acceptable conditions during generation of data. DQOs will also be assessed at this point by comparing the results of QC measurements with pre-established criteria as a measure of data acceptability.

The analysts and/or laboratory department manager will prepare a preliminary QC checklist for each parameter and for each sample delivery group (SDG) as soon as analysis of an SDG has been completed. Any deviations from the DQOs listed on the checklist will be brought to the attention of the Laboratory Manager to determine whether corrective action is needed and to determine the impact on the reporting schedule.

Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. Data quality will be assessed by a reviewer using current CLP NFG data validation requirements (EPA 1999; EPA 2002) by considering the following:

- Holding times

- Initial calibrations
- Continuing calibrations
- Method blanks
- Surrogate recoveries
- Detection limits
- Reporting limits
- Laboratory control samples
- MS/MSD samples
- Standard reference material results

The data will be validated in accordance with the project specific DQOs described above, analytical method criteria, and the laboratory's internal performance standards based on their SOPs.

5.3 Reconciliation with User Requirements

The QA/QC Manager will review data to determine if DQOs have been met. If data do not meet the project's specifications, the QA/QC Manager will review the errors and determine if the problem is due to calibration/maintenance, sampling techniques, or other factors, and will suggest corrective action. It is expected that the problem would be able to be corrected by retraining, revision of techniques, or replacement of supplies/equipment; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA/QC Manager will recommend appropriate modifications. Any revisions will require approval by EPA. If matrix interference is suspected to have attributed to the exceedance, adequate lab documentation must be presented to demonstrate that instrument performance and/or laboratory technique did not bias the result. In cases where the DQOs have been exceeded and corrective actions did not resolve the outlier, data will be qualified per CLP NFG (EPA 1999, 2004). In these instances, the usability of the data will be determined by the extent of the exceedance.

6 References

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Tables

Table A-1. Measurement Quality Control Indicators

Bremerton Gas Works Site
Bremerton, Washington

Measurement Quality Indicators	QC Parameters
Precision	RPD values of:
	(1) LCS/LCS Duplicate
	(2) MS/MSD
	(3) Field Duplicates
Accuracy/Bias	Percent Recovery (%R) or Percent Difference (%D) values of:
	(1) Initial Calibration and Calibration Verification
	(2) LCS
	(3) MS
	(4) Surrogate Spikes
	Results of:
	(1) Instrument and Calibration Blank
	(2) Method (Preparation) Blank
	(3) Trip Blank
	(4) Equipment Rinsate Blank
Representativeness	Results of All Blanks
	Sample Integrity (CoC and Sample Receipt Forms)
	Holding Times
Comparability	Sample-specific reporting limits
	Sample Collection Methods
	Laboratory Analytical Methods
Completeness	Data qualifiers
	Laboratory deliverables
	Requested/Reported valid results
Sensitivity	MDLs and MRLs

Notes:

LCS – Laboratory Control Sample
MDL - Method detection limit
MRL - Method reporting limit
MS/MSD - Matrix spike/matrix spike duplicate

Table A-2. Measurement Quality Objectives for Soil Samples

Bremerton Gas Works Site
Bremerton, Washington

Analyte Name	MDL[(1)]	MRL	LCS/LCS %R[(A)]	MS/MSD %R[(A)]	RPD (%)	Surrogate %R[(A)]
Cyanide, Total by EPA 9014 (mg/kg)						
Cyanide	0.0300	0.0500	75 - 120	75 - 125	20	n/a
Total Organic Carbon by Plumb 1981 (%)						
Total Organic Carbon	n/a	0.200	75 - 120	75 - 125	20	n/a
Metals by EPA 200.8 (mg/kg)						
Antimony	0.0000100	0.000200	75 - 125	80 - 120	20	n/a
Arsenic	0.0000480	0.000200	75 - 125	80 - 120	20	n/a
Beryllium	0.0000210	0.000200	75 - 125	80 - 120	20	n/a
Cadmium	0.0000100	0.000100	75 - 125	80 - 120	20	n/a
Chromium	0.0000450	0.000500	75 - 125	80 - 120	20	n/a
Cobalt	0.0000110	0.000200	75 - 125	80 - 120	20	n/a
Copper	0.000158	0.000500	75 - 125	80 - 120	20	n/a
Lead	0.0000460	0.000100	75 - 125	80 - 120	20	n/a
Manganese	0.0000220	0.000500	75 - 125	80 - 120	20	n/a
Nickel	0.0000790	0.000500	75 - 125	80 - 120	20	n/a
Selenium	0.000324	0.00200	75 - 125	80 - 120	20	n/a
Silver	0.00000800	0.000200	75 - 125	80 - 120	20	n/a
Thallium	0.00000400	0.000200	75 - 125	80 - 120	20	n/a
Zinc	0.000497	0.00400	75 - 125	80 - 120	20	n/a
Mercury by EPA 7471B (mg/kg)						
Mercury	0.00210	0.0250	75 - 125	80 - 120	20	n/a
Volatile Organic Compounds (VOCs) by SW8260C (ug/kg)						
1,1,1,2-Tetrachloroethane	0.233	1.00	80 - 120	80 - 120	30	n/a
1,1,1-Trichloroethane	0.226	1.00	78 - 133	78 - 133	30	n/a
1,1,2,2-Tetrachloroethane	0.253	1.00	71 - 120	71 - 120	30	n/a
1,1,2-Trichloroethane	0.286	1.00	77 - 120	77 - 120	30	n/a
1,1,2-Trichlorotrifluoroethane (Freon 113)	0.287	2.00	72 - 142	72 - 142	30	n/a
1,1-Dichloroethane	0.203	1.00	65 - 139	65 - 139	30	n/a
1,1-Dichloroethene	0.336	1.00	73 - 138	73 - 138	30	n/a
1,2,3-Trichlorobenzene	0.305	5.00	76 - 122	76 - 122	30	n/a
1,2,3-Trichloropropane	0.517	2.00	75 - 120	75 - 120	30	n/a
1,2,4-Trimethylbenzene	0.230	1.00	77 - 125	77 - 125	30	n/a
1,2-Dibromo-3-chloropropane	0.586	5.00	61 - 128	61 - 128	30	n/a
1,2-Dichloroethane	0.191	1.00	77 - 120	77 - 120	30	n/a
1,2-Dichloroethene, cis-	0.240	1.00	75 - 124	75 - 124	30	n/a
1,2-Dichloroethene, trans-	0.266	1.00	73 - 131	73 - 131	30	n/a
1,2-Dichloropropane	0.162	1.00	74 - 120	74 - 120	30	n/a
1,3,5-Trimethylbenzene (Mesitylene)	0.254	1.00	77 - 126	77 - 126	30	n/a
1,3-Dichloropropane	0.209	1.00	77 - 120	77 - 120	30	n/a
1,3-Dichloropropene, cis-	0226	1.00	80 - 124	80 - 124	30	n/a
1,3-Dichloropropene, trans-	0.216	1.00	80 - 126	80 - 126	30	n/a
1,4-Dichloro-2-butene, trans-	0.437	5.00	62 - 127	62 - 127	30	n/a
2-Butanone (MEK)	0.513	5.00	64 - 120	64 - 120	30	n/a
2-Hexanone (Methyl butyl ketone)	0.439	5.00	62 - 128	62 - 128	30	n/a
4-Chlorotoluene	0.277	1.00	75 - 121	75 - 121	30	n/a
4-Isopropyltoluene (4-Cymene)	0.236	1.00	78 - 131	78 - 131	30	n/a
Acetone	0.482	5.00	48 - 132	48 - 132	30	n/a
Acrolein	3.81	50.0	60 - 130	60 - 130	30	n/a
Acrylonitrile	1.03	5.00	59 - 124	59 - 124	30	n/a
Benzene	0.296	1.00	80 - 120	80 - 120	30	n/a
Bromobenzene	0.153	1.00	75 - 120	75 - 120	30	n/a
Bromochloromethane	0.323	1.00	69 - 133	69 - 133	30	n/a
Bromodichloromethane	0.254	1.00	80 - 122	80 - 122	30	n/a
Bromoform (Tribromomethane)	0.297	1.00	63 - 120	63 - 120	30	n/a
Bromomethane (Methyl bromide)	0.187	1.00	40 - 172	40 - 172	30	n/a
Carbon disulfide	0.559	1.00	72 - 146	72 - 146	30	n/a
Carbon tetrachloride (Tetrachloromethane)	0.213	1.00	76 - 136	76 - 136	30	n/a
Chlorobenzene	0.219	1.00	80 - 120	80 - 120	30	n/a
Chloroethane	0.462	1.00	53 - 154	53 - 154	30	n/a
Chloroform	0.234	1.00	75 - 126	75 - 126	30	n/a
Chloromethane	0.263	1.00	65 - 129	65 - 129	30	n/a
Dibromochloromethane	0.266	1.00	77 - 123	77 - 123	30	n/a
Dibromomethane	0.147	1.00	80 - 120	80 - 120	30	n/a
Dichlorodifluoromethane	0.207	1.00	67 - 142	67 - 142	30	n/a
Dichloromethane (Methylene chloride)	0.635	2.00	61 - 128	61 - 128	30	n/a
Ethylbenzene	0.202	1.00	80 - 120	80 - 120	30	n/a
Ethylene dibromide (1,2-Dibromoethane)	0.176	1.00	79 - 120	79 - 120	30	n/a
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	0.410	5.00	72 - 135	72 - 135	30	n/a
Isopropylbenzene (Cumene)	0.233	1.00	77 - 127	77 - 127	30	n/a
Methyl iodide (Iodomethane)	0.215	1.00	34 - 181	34 - 181	30	n/a
Methyl isobutyl ketone (4-Methyl-2-pentanone or (MIBK))	0.420	5.00	70 - 124	70 - 124	30	n/a
Methyl tert-butyl ether (MTBE)	0.231	1.00	68 - 124	68 - 124	30	n/a
n-Butylbenzene	0.262	1.00	75 - 134	75 - 134	30	n/a
n-Propylbenzene	0.272	1.00	76 - 126	76 - 126	30	n/a
o-Xylene	0.224	1.00	80 - 120	80 - 120	30	n/a
sec-Butylbenzene	0.240	1.00	77 - 127	77 - 127	30	n/a
Styrene	0.138	1.00	80 - 122	80 - 122	30	n/a

Table A-2. Measurement Quality Objectives for Soil Samples

Bremerton Gas Works Site
Bremerton, Washington

Analyte Name	MDL[1]	MRL	LCS/LCS %R[A]	MS/MSD %R[A]	RPD (%)	Surrogate %R[A]
tert-Butylbenzene	0.306	1.00	77 - 125	77 - 125	30	n/a
Tetrachloroethene (PCE)	0.257	1.00	76 - 131	76 - 131	30	n/a
Toluene	0.151	1.00	78 - 120	78 - 120	30	n/a
Trichloroethene (TCE)	0.212	1.00	80 - 120	80 - 120	30	n/a
Trichlorofluoromethane (Fluorotrichloromethane)	0.266	1.00	57 - 161	57 - 161	30	n/a
Vinyl acetate	0.381	5.00	54 - 138	54 - 138	30	n/a
Vinyl chloride	0.235	1.00	74 - 134	74 - 134	30	n/a
1,2-Dichloroethane-d4	n/a	n/a	n/a	n/a	n/a	80 - 149
1,2-Dichlorobenzene-d4	n/a	n/a	n/a	n/a	n/a	80 - 120
Toluene-d8	n/a	n/a	n/a	n/a	n/a	77 - 120
4-Bromofluorobenzene	n/a	n/a	n/a	n/a	n/a	80 - 120
Dibromofluoromethane	n/a	n/a	n/a	n/a	n/a	80 - 120
Semivolatile Organic Compounds (SVOCs) by SW8270D (ug/kg)						
1,2,4-Trichlorobenzene	15.9	67.0	50 - 120	50 - 120	30	n/a
1,2-Dichlorobenzene	18.4	67.0	48 - 120	48 - 120	30	n/a
1,3-Dichlorobenzene	15.7	67.0	47 - 120	47 - 120	30	n/a
1,4-Dichlorobenzene	15.6	67.0	46 - 120	46 - 120	30	n/a
1,4-Dioxane	n/a	67.0	n/a	n/a	30	n/a
2,2'-Oxybis (1-chloropropane)	18.7	67.0	36 - 120	36 - 120	30	n/a
2,4,5-Trichlorophenol	150	330	52 - 120	52 - 120	30	n/a
2,4,6-Trichlorophenol	142	330	51 - 120	51 - 120	30	n/a
2,4-Dichlorophenol	74.7	330	51 - 120	51 - 120	30	n/a
2,4-Dimethylphenol	16.2	67.0	40 - 120	40 - 120	30	n/a
2,4-Dinitrophenol	77.3	670	15 - 169	15 - 169	30	n/a
2,4-Dinitrotoluene	96.0	330	57 - 127	57 - 127	30	n/a
2,6-Dinitrotoluene	96.0	330	54 - 124	54 - 124	30	n/a
2-Chloronaphthalene	21.3	67.0	48 - 120	48 - 120	30	n/a
2-Chlorophenol	14.3	67.0	45 - 120	45 - 120	30	n/a
2-Methylphenol (o-Cresol)	23.3	67.0	45 - 120	45 - 120	30	n/a
2-Nitroaniline	120	330	51 - 120	51 - 120	30	n/a
2-Nitrophenol	63.4	67.0	50 - 120	50 - 120	30	n/a
3,3'-Dichlorobenzidine	89.3	330	37 - 140	37 - 140	30	n/a
3-Methylphenol & 4-Methylphenol (m&p-Cresol)	n/a	n/a	n/a	n/a	n/a	n/a
3-Methylphenol (m-Cresol)	n/a	n/a	n/a	n/a	n/a	n/a
3-Nitroaniline	104	330	39 - 142	39 - 142	30	n/a
4-Bromophenyl-phenyl ether	19.3	67.0	50 - 120	50 - 120	30	n/a
4-Chloro-3-methylphenol	115	330	54 - 120	54 - 120	30	n/a
4-Chloroaniline	100	330	17 - 149	17 - 149	30	n/a
4-Methylphenol (p-Cresol)	22.4	67.0	47 - 120	47 - 120	30	n/a
4-Nitroaniline	102	330	47 - 124	47 - 124	30	n/a
4-Nitrophenol	48.2	330	23 - 130	23 - 130	30	n/a
Aniline	21.8	67.0	10 - 129	10 - 129	30	n/a
Benzidine	210	670	57 - 120	57 - 120	30	n/a
Benzoic acid	251	670	10 - 160	10 - 160	30	n/a
Benzyl alcohol	86.7	330	16 - 120	16 - 120	30	n/a
Biphenyl (1,1'-Biphenyl)	1.44	5.00	30 - 160	30 - 160	30	n/a
bis(2-Chloroethoxy)methane	17.3	67.0	49 - 120	49 - 120	30	n/a
bis(2-Chloroethyl)ether	16.9	67.0	43 - 120	43 - 120	30	n/a
bis(2-Ethylhexyl)phthalate	23.9	67.0	63 - 128	63 - 128	30	n/a
Butylbenzyl phthalate	24.6	67.0	44 - 144	44 - 144	30	n/a
Dibenzofuran	18.2	67.0	55 - 120	55 - 120	30	n/a
Diethyl phthalate	20.9	67.0	54 - 120	54 - 120	30	n/a
Dimethyl phthalate	26.5	67.0	56 - 120	56 - 120	30	n/a
Di-n-butyl phthalate	33.1	67.0	60 - 120	60 - 120	30	n/a
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	122	670	10 - 157	10 - 157	30	n/a
Di-n-octyl phthalate	19.1	67.0	59 - 120	59 - 120	30	n/a
Hexachlorobenzene	18.9	67.0	50 - 121	50 - 121	30	n/a
Hexachlorocyclopentadiene	62.4	330	23 - 149	23 - 149	30	n/a
Hexachloroethane	18.8	67.0	43 - 120	43 - 120	30	n/a
Isophorone	13.4	67.0	57 - 120	57 - 120	30	n/a
Nitrobenzene	25.6	67.0	39 - 120	39 - 120	30	n/a
n-Nitrosodimethylamine	84.0	330	43 - 120	43 - 120	30	n/a
n-Nitrosodi-n-propylamine	20.8	67.0	44 - 120	44 - 120	30	n/a
n-Nitrosodiphenylamine	16.9	67.0	54 - 138	54 - 138	30	n/a
Pentachlorophenol	96.7	330	40 - 123	40 - 123	30	n/a
Phenol	16.1	67.0	37 - 120	37 - 120	30	n/a
2-Fluorophenol	n/a	n/a	n/a	n/a	n/a	22 - 120
Phenol-d5	n/a	n/a	n/a	n/a	n/a	27 - 120
2-Chlorophenol-d4	n/a	n/a	n/a	n/a	n/a	36 - 120
1,2-Dichlorobenzene-d4	n/a	n/a	n/a	n/a	n/a	38 - 120
Nitrobenzene-d5	n/a	n/a	n/a	n/a	n/a	32 - 120

Table A-2. Measurement Quality Objectives for Soil Samples

Bremerton Gas Works Site
Bremerton, Washington

Analyte Name	MDL[(1)]	MRL	LCS/LCS %R[(A)]	MS/MSD %R[(A)]	RPD (%)	Surrogate %R[(A)]
2-Fluorobiphenyl	n/a	n/a	n/a	n/a	n/a	39 - 120
2,4,6-Tribromophenol	n/a	n/a	n/a	n/a	n/a	31 - 131
p-Terphenyl-d14	n/a	n/a	n/a	n/a	n/a	31 - 130
Polycyclic Aromatic Hydrocarbons by SW8270D-SIM (ug/kg)						
1-Methylnaphthalene	1.61	5.00	39 - 120	39 - 120	30	n/a
2-Methylnaphthalene	1.69	5.00	35 - 120	35 - 120	30	n/a
Acenaphthene	1.49	5.00	39 - 120	39 - 120	30	n/a
Acenaphthylene	1.61	5.00	35 - 120	35 - 120	30	n/a
Anthracene	1.78	5.00	36 - 120	36 - 120	30	n/a
Benzo(a)anthracene	2.22	5.00	42 - 120	42 - 120	30	n/a
Benzo(a)pyrene	2.38	5.00	36 - 120	36 - 120	30	n/a
Benzo(b)fluoranthene	2.11	5.00	35 - 127	35 - 127	30	n/a
Benzo(g,h,i)perylene	2.79	5.00	38 - 120	38 - 120	30	n/a
Benzo(k)fluoranthene	2.28	5.00	37 - 129	37 - 129	30	n/a
Chrysene	1.92	5.00	48 - 120	48 - 120	30	n/a
Dibenzo(a,h)anthracene	2.56	5.00	38 - 120	38 - 120	30	n/a
Fluoranthene	1.87	5.00	46 - 120	46 - 120	30	n/a
Fluorene	1.47	5.00	41 - 120	41 - 120	30	n/a
Indeno(1,2,3-c,d)pyrene	3.01	5.00	40 - 120	40 - 120	30	n/a
Naphthalene	2.26	5.00	36 - 120	36 - 120	30	n/a
Phenanthrene	1.58	5.00	46 - 120	46 - 120	30	n/a
Pyrene	2.26	5.00	49 - 120	49 - 120	30	n/a
Total HPAH	n/a	n/a	n/a	n/a	n/a	n/a
Total LPAH	n/a	n/a	n/a	n/a	n/a	n/a
Total PAH	n/a	n/a	n/a	n/a	n/a	n/a
2-Methylnaphthalene-d10	n/a	n/a	n/a	n/a	n/a	32 - 120
Dibenzo[a,h]anthracene-d14	n/a	n/a	n/a	n/a	n/a	21 - 133
Fluoranthene-d10	n/a	n/a	n/a	n/a	n/a	36 - 134
Petroleum Hydrocarbons by NWTPH-HCID (mg/kg)						
Gasoline Range Hydrocarbons	n/a	20	n/a	n/a	n/a	n/a
Diesel Range Hydrocarbons	1.50	50	n/a	n/a	n/a	n/a
Oil Range Hydrocarbons	3.00	100	n/a	n/a	n/a	n/a
o-Terphenyl	n/a	n/a	n/a	n/a	n/a	50-150
n-Triacontane	n/a	n/a	n/a	n/a	n/a	50-150
Organichlorine Pesticides by EPA 8081B (mg/kg)						
alpha-BHC	0.00017	0.0017	39-120	39-120	30	n/a
beta-BHC	0.000318	0.0017	43-120	43-120	30	n/a
gamma-BHC (Lindane)	0.000175	0.0017	46-120	46-120	30	n/a
delta-BHC	0.0003	0.0017	31-132	31-132	30	n/a
Heptachlor	0.000218	0.0017	40-120	40-120	30	n/a
Aldrin	0.000218	0.0017	40-120	40-120	30	n/a
Heptachlor Epoxide	0.000286	0.0017	46-126	46-126	30	n/a
trans-Chlordane	0.000264	0.0017	44-125	44-125	30	n/a
cis-Chlordane	0.000282	0.0017	43-127	43-127	30	n/a
Endosulfan I	0.000273	0.0017	41-130	41-130	30	n/a
4,4'-DDE	0.000568	0.0033	60-134	60-134	30	n/a
Dieldrin	0.000563	0.0033	44-129	44-129	30	n/a
Endrin	0.000518	0.0033	56-120	56-120	30	n/a
Endosulfan II	0.000561	0.0033	56-120	56-120	30	n/a
4,4'-DDD	0.000575	0.0033	60-120	60-120	30	n/a
Endrin Aldehyde	0.000963	0.0033	32-120	32-120	30	n/a
4,4'-DDT	0.000572	0.0033	63-120	63-120	30	n/a
Endosulfan Sulfate	0.000844	0.0033	47-120	47-120	30	n/a
Endrin Ketone	0.000663	0.0033	64-120	64-120	30	n/a
Methoxychlor	0.00352	0.017	58-120	58-120	30	n/a
Polychlorinated Biphenyls by EPA 8082 (mg/kg)						
Aroclor 1016	0.0107	0.33	51-120	51-120	30	n/a
Aroclor 1221	0.0107	0.33	51-120	51-120	31	n/a
Aroclor 1232	0.0107	0.33	51-120	51-120	32	n/a
Aroclor 1242	0.0107	0.33	51-120	51-120	33	n/a
Aroclor 1248	0.0107	0.33	51-120	51-120	34	n/a
Aroclor 1254	0.0107	0.33	51-120	51-120	35	n/a
Aroclor 1260	0.0144	0.33	59-120	59-120	30	n/a

Notes:

(1) - Based on current laboratory control criteria. Some values may vary slightly between instruments and can be subject to change as the laboratory updates the charted values periodically.

%R - Percent recovery

EDL - Estimated detection limit; value is calculated based on actual instrument response on a sample-specific basis.

LCS/LCSD - Laboratory control samples and laboratory control sample duplicate

MDL - Method detection limit

mg/kg - milligram per kilogram

MRL - Method reporting limit

MS/MSD - Matrix spike and matrix spike duplicate

n/a - not applicable

ng/kg - nanogram per kilogram

RPD - Relative percent difference

Table A-3. Measurement Quality Objectives for Groundwater Samples

Bremerton Gas Works Site
Bremerton, Washington

Analyte Name	MDL[1]	MRL	LCS/LCS %R[A]	MS/MSD %R[A]	RPD (%)	Surrogate %R[A]
Conventional Chemical Parameters (mg/L)						
Ammonia as Nitrogen	0.0130	0.100	75 - 120	75 - 125	20	n/a
Cyanide	0.00300	0.00500	75 - 120	75 - 125	20	n/a
Sulfide	0.0300	0.0500	75 - 120	75 - 125	20	n/a
Total and Dissolved Metals by EPA 200.8 (µg/L)						
Antimony	0.01	0.2	80 - 120	75 - 125	20	n/a
Arsenic	0.048	0.2	80 - 120	75 - 125	20	n/a
Beryllium	0.021	0.2	80 - 120	75 - 125	20	n/a
Cadmium	0.01	0.1	80 - 120	75 - 125	20	n/a
Chromium	0.045	0.5	80 - 120	75 - 125	20	n/a
Chromium VI (SM3500-Cr-B)	0.003	0.01	75-125	75-125	20	n/a
Copper	0.158	0.5	80 - 120	75 - 125	20	n/a
Lead	0.046	0.1	80 - 120	75 - 125	20	n/a
Nickel	0.079	0.5	80 - 120	75 - 125	20	n/a
Selenium	0.127	0.5	80 - 120	75 - 125	20	n/a
Silver	0.008	0.2	80 - 120	75 - 125	20	n/a
Thallium	0.004	0.2	80 - 120	75 - 125	20	n/a
Zinc	0.497	4.0	80 - 120	75 - 125	20	n/a
Total and Dissolved Mercury by EPA 7470A (µg/L)						
Mercury	0.007000	0.100	80 - 120	75 - 125	20	n/a
Volatile Organic Compounds (VOCs) by SW8260C (µg/L)						
1,1,1,2-Tetrachloroethane	0.0396	0.200	80 - 128	80 - 128	30	n/a
1,1,1-Trichloroethane	0.0408	0.200	79 - 124	79 - 124	30	n/a
1,1,2,2-Tetrachloroethane	0.0598	0.200	80 - 120	80 - 120	30	n/a
1,1,2-Trichloroethane	0.129	0.200	80 - 120	80 - 120	30	n/a
1,1,2-Trichlorotrifluoroethane (Freon 113)	0.0429	0.200	76 - 124	76 - 124	30	n/a
1,1-Dichloroethane	0.0533	0.200	80 - 120	80 - 120	30	n/a
1,1-Dichloroethene	0.0540	0.200	74 - 120	74 - 120	30	n/a
1,2,3-Trichlorobenzene	0.110	0.500	80 - 125	80 - 125	30	n/a
1,2,3-Trichloropropane	0.131	0.500	80 - 120	80 - 120	30	n/a
1,2,4-Trimethylbenzene	0.0243	0.200	80 - 122	80 - 122	30	n/a
1,2-Dibromo-3-chloropropane	0.366	0.500	79 - 129	79 - 129	30	n/a
1,2-Dichloroethane	0.0717	0.200	80 - 121	80 - 121	30	n/a
1,2-Dichloroethene, cis-	0.0427	0.200	78 - 120	78 - 120	30	n/a
1,2-Dichloroethene, trans-	0.0485	0.200	75 - 120	75 - 120	30	n/a
1,2-Dichloropropane	0.0352	0.200	80 - 120	80 - 120	30	n/a
1,3,5-Trimethylbenzene (Mesitylene)	0.0150	0.200	80 - 120	80 - 120	30	n/a
1,3-Dichloropropane	0.0622	0.200	80 - 120	80 - 120	30	n/a
1,3-Dichloropropene, cis-	0.0610	0.200	80 - 127	80 - 127	30	n/a
1,3-Dichloropropene, trans-	0.0815	0.200	79 - 132	79 - 132	30	n/a
1,4-Dichloro-2-butene, trans-	0.324	1.00	47 - 147	47 - 147	30	n/a
2-Butanone (MEK)	0.814	5.00	73 - 123	73 - 123	30	n/a
2-Chlorotoluene	0.0236	0.200	80 - 120	80 - 120	30	n/a
2-Hexanone (Methyl butyl ketone)	0.902	5.00	80 - 129	80 - 129	30	n/a
4-Chlorotoluene	0.0159	0.200	80 - 120	80 - 120	30	n/a
4-Isopropyltoluene (4-Cymene)	0.0263	0.200	80 - 124	80 - 124	30	n/a
Acetone	2.06	5.00	64 - 125	64 - 125	30	n/a
Acrolein	2.48	5.00	60 - 124	60 - 124	30	n/a
Acrylonitrile	0.604	1.00	76 - 123	76 - 123	30	n/a
Benzene	0.0266	0.200	80 - 120	80 - 120	30	n/a
Bromobenzene	0.0605	0.200	80 - 120	80 - 120	30	n/a
Bromochloromethane	0.0607	0.200	80 - 120	80 - 120	30	n/a
Bromodichloromethane	0.0506	0.200	80 - 122	80 - 122	30	n/a
Bromoform (Tribromomethane)	0.0618	0.200	62 - 149	62 - 149	30	n/a
Bromomethane (Methyl bromide)	0.252	1.00	68 - 130	68 - 130	30	n/a
Carbon disulfide	0.0370	0.200	77 - 124	77 - 124	30	n/a
Carbon tetrachloride (Tetrachloromethane)	0.0439	0.200	71 - 139	71 - 139	30	n/a
Chlorobenzene	0.0230	0.200	80 - 120	80 - 120	30	n/a
Chloroethane	0.0861	0.200	68 - 133	68 - 133	30	n/a
Chloroform	0.0273	0.200	80 - 120	80 - 120	30	n/a
Chloromethane	0.0948	0.500	77 - 122	77 - 122	30	n/a
Dibromochloromethane	0.0481	0.200	80 - 120	80 - 120	30	n/a
Dibromomethane	0.145	0.200	80 - 120	80 - 120	30	n/a
Dichlorodifluoromethane	0.0521	0.200	68 - 133	68 - 133	30	n/a
Dichloromethane (Methylene chloride)	0.485	1.00	71 - 125	71 - 125	30	n/a
Ethylbenzene	0.0371	0.200	80 - 120	80 - 120	30	n/a
Ethylene dibromide (1,2-Dibromoethane)	0.0745	0.200	80 - 120	80 - 120	30	n/a
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	0.0734	0.500	80 - 135	80 - 135	30	n/a
Isopropylbenzene (Cumene)	0.0212	0.200	80 - 120	80 - 120	30	n/a
Methyl iodide (Iodomethane)	0.227	1.00	76 - 123	76 - 123	30	n/a
Methyl isobutyl ketone (4-Methyl-2-pentanone or (MIBK))	0.974	5.00	80 - 125	80 - 125	30	n/a
Methyl tert-butyl ether (MTBE)	0.0729	0.500	79 - 121	79 - 121	30	n/a
n-Butylbenzene	0.0248	0.200	80 - 125	80 - 125	30	n/a
n-Propylbenzene	0.0235	0.200	80 - 120	80 - 120	30	n/a
o-Xylene	0.0349	0.200	80 - 120	80 - 120	30	n/a
sec-Butylbenzene	0.0237	0.200	80 - 121	80 - 121	30	n/a
Styrene	0.0454	0.200	80 - 121	80 - 121	30	n/a

Table A-3. Measurement Quality Objectives for Groundwater Samples

Bremerton Gas Works Site
Bremerton, Washington

tert-Butylbenzene	0.0256	0.200	80 - 121	80 - 121	30	n/a
Tetrachloroethene (PCE)	0.0474	0.200	80 - 120	80 - 120	30	n/a
Toluene	0.0399	0.200	80 - 120	80 - 120	30	n/a
Trichloroethene (TCE)	0.0489	0.200	80 - 120	80 - 120	30	n/a
Trichlorofluoromethane (Fluorotrichloromethane)	0.0375	0.200	74 - 135	74 - 135	30	n/a
Vinyl acetate	0.0688	0.200	74 - 120	74 - 120	30	n/a
Vinyl chloride	0.0572	0.200	74 - 123	74 - 123	30	n/a
Semivolatile Organic Compounds (SVOCs) by SW8270D (µg/L)						
1,2,4-Trichlorobenzene	0.254	1.00	28 - 120	28 - 120	30	n/a
1,2-Dichlorobenzene	0.250	1.00	28 - 120	28 - 120	30	n/a
1,3-Dichlorobenzene	0.266	1.00	24 - 120	24 - 120	30	n/a
1,4-Dichlorobenzene	0267	1.00	24 - 120	24 - 120	30	n/a
1,4-Dioxane	0.0847	0.4	45-120	45-120	40	39-129
2,2'-Oxybis (1-chloropropane)	0.241	1.00	47 - 120	47 - 120	30	n/a
2,3,4,6-Tetrachlorophenol	0.244	1.00	0	0	30	n/a
2,4,5-Trichlorophenol	1.10	5.00	58 - 120	58 - 120	30	n/a
2,4,6-Trichlorophenol	1.04	3.00	53 - 120	53 - 120	30	n/a
2,4-Dichlorophenol	1.11	3.00	54 - 120	54 - 120	30	n/a
2,4-Dimethylphenol	1.12	3.00	37 - 120	37 - 120	30	n/a
2,4-Dinitrophenol	3.35	20.0	40 - 120	40 - 120	30	n/a
2,4-Dinitrotoluene	1.12	3.00	51 - 120	51 - 120	30	n/a
2,6-Dinitrotoluene	1.14	3.00	52 - 120	52 - 120	30	n/a
2-Chloronaphthalene	0.248	1.00	42 - 120	42 - 120	30	n/a
2-Chlorophenol	0.220	1.00	48 - 120	48 - 120	30	n/a
2-Methylphenol (o-Cresol)	0.211	1.00	44 - 120	44 - 120	30	n/a
2-Nitroaniline	1.46	3.00	31 - 120	31 - 120	30	n/a
2-Nitrophenol	0.263	3.00	47 - 120	47 - 120	30	n/a
3,3'-Dichlorobenzidine	1.77	5.00	44 - 120	44 - 120	30	n/a
3-Methylphenol & 4-Methylphenol (m&p-Cresol)	n/a	n/a	n/a	n/a	n/a	n/a
3-Methylphenol (m-Cresol)	n/a	n/a	n/a	n/a	n/a	n/a
3-Nitroaniline	1.53	3.00	36 - 120	36 - 120	30	n/a
4-Bromophenyl-phenyl ether	0.238	1.00	56 - 120	56 - 120	30	n/a
4-Chloro-3-methylphenol	1.12	3.00	59 - 120	59 - 120	30	n/a
4-Chloroaniline	1.73	5.00	10 - 132	10 - 132	30	n/a
4-Methylphenol (p-Cresol)	0.468	2.00	48 - 120	48 - 120	30	n/a
4-Nitroaniline	2.02	3.00	25 - 132	25 - 132	30	n/a
4-Nitrophenol	1.75	10.0	44 - 129	44 - 129	30	n/a
Aniline	0.973	1.00	21 - 120	21 - 120	30	n/a
Benzoic acid	3.92	3.92	37 - 120	37 - 120	30	n/a
Benzyl alcohol	0.552	0.552	26 - 120	26 - 120	30	n/a
bis(2-Chloroethoxy)methane	0.237	1.00	48 - 120	48 - 120	30	n/a
bis(2-Chloroethyl)ether	0.248	1.00	50 - 120	50 - 120	30	n/a
bis(2-Ethylhexyl)phthalate	2.14	3.00	58 - 120	58 - 120	30	n/a
Butylbenzyl phthalate	0.299	1.00	54 - 120	54 - 120	30	n/a
Dibenzofuran	0.309	1.00	36 - 120	36 - 120	30	n/a
Diethyl phthalate	0.273	1.00	60 - 120	60 - 120	30	n/a
Dimethyl phthalate	0.259	1.00	61 - 120	61 - 120	30	n/a
Di-n-butyl phthalate	0.291	1.00	65 - 120	65 - 120	30	n/a
Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)	3.61	10.0	56 - 120	56 - 120	30	n/a
Di-n-octyl phthalate	0.268	1.00	62 - 120	62 - 120	30	n/a
Hexachlorobenzene	0.280	1.00	54 - 120	54 - 120	30	n/a
Hexachlorocyclopentadiene	1.08	5.00	16 - 120	16 - 120	30	n/a
Hexachloroethane	0.300	2.00	18 - 120	18 - 120	30	n/a
Isophorone	0.423	1.00	57 - 120	57 - 120	30	n/a
Nitrobenzene	0.253	1.00	49 - 120	49 - 120	30	n/a
n-Nitrosodimethylamine	1.33	3.00	41 - 120	41 - 120	30	n/a
n-Nitrosodi-n-propylamine	0.269	1.00	50 - 120	50 - 120	30	n/a
n-Nitrosodiphenylamine	0.299	1.00	48 - 120	48 - 120	30	n/a
Pentachlorophenol	1.89	10.0	40 - 131	40 - 131	30	n/a
Phenol	0.271	1.00	48 - 120	48 - 120	30	n/a
Polycyclic Aromatic Hydrocarbons (PAHs) by SW8270D-SIM (µg/L)						
1-Methylnaphthalene	0.00313	0.0100	29 - 120	29 - 120	30	n/a
2-Methylnaphthalene	0.00384	0.0100	37 - 120	37 - 120	30	n/a
Acenaphthene	0.00311	0.0100	41 - 120	41 - 120	30	n/a
Acenaphthylene	0.00317	0.0100	41 - 120	41 - 120	30	n/a
Anthracene	0.00248	0.0100	40 - 120	40 - 120	30	n/a
Benzo(a)anthracene	0.00347	0.0100	42 - 120	42 - 120	30	n/a
Benzo(a)pyrene	0.00237	0.0100	35 - 120	35 - 120	30	n/a
Benzo(b)fluoranthene	0.00356	0.0100	44 - 120	44 - 120	30	n/a
Benzo(g,h,i)perylene	0.00312	0.0100	38 - 120	38 - 120	30	n/a
Benzo(k)fluoranthene	0.00345	0.0100	50 - 120	50 - 120	30	n/a
Chrysene	0.00313	0.0100	44 - 120	44 - 120	30	n/a
Dibenzo(a,h)anthracene	0.00303	0.0100	34 - 120	34 - 120	30	n/a
Fluoranthene	0.00337	0.0100	45 - 120	45 - 120	30	n/a
Fluorene	0.00317	0.0100	43 - 120	43 - 120	30	n/a
Indeno(1,2,3-c,d)pyrene	0.00334	0.0100	37 - 120	37 - 120	30	n/a
Naphthalene	0.00740	0.0100	37 - 120	37 - 120	30	n/a
Phenanthrene	0.00299	0.0100	41 - 120	41 - 120	30	n/a
Pyrene	0.00417	0.0100	41 - 120	41 - 120	30	n/a

Table A-3. Measurement Quality Objectives for Groundwater Samples

Bremerton Gas Works Site
Bremerton, Washington

Total Benzofluoranthenes (b,j,k)	0.00356	0.0100	46 - 120	46 - 120	30	n/a
Total HPAH	n/a	n/a	n/a	n/a	n/a	n/a
Total LPAH	n/a	n/a	n/a	n/a	n/a	n/a
Total PAH	n/a	n/a	n/a	n/a	n/a	n/a
Petroleum Hydrocarbons by NWTPH-HCID (µg/L)						
Gasoline Range Hydrocarbons	n/a	250	n/a	n/a	n/a	n/a
Diesel Range Hydrocarbons	30	500	n/a	n/a	n/a	n/a
Oil Range Hydrocarbons	50	1000	n/a	n/a	n/a	n/a

Notes:

(1) - Based on current laboratory control criteria. Some values may vary slightly between instruments and can be subject to change as the laboratory updates the charted values periodically.

%R - Percent recovery

LCS/LCSD - Laboratory control samples and laboratory control sample duplicate

MDL - Method detection limit

mg/L - milligram per liter

MRL - Method reporting limit

MS/MSD - Matrix spike and matrix spike duplicate

n/a - not applicable

RPD - Relative percent difference

tbd - to be determined

Table A-4. Soil Sampling and Analysis Approach – Shallow Soil Investigation

Bremerton Gas Works Site
Bremerton, Washington

Exploration Type	Exploration Identification	Primary Exploration Objective	Target Exploration Depth (feet bgs)[1]	Sample Depth (feet bgs)[1]	Soil Sample Chemical Analysis: VOCs Full List	VOCs BTEX	SVOCs Full List	SVOCs PAHs	Cyanide	Metals[2]	Pesticides	PCBs	Location Modification Decision Criteria
Shallow Test Pit	TP-01	Characterize shoreline fill material and evaluate shallow soil quality at the top of the bluff on the northern edge of the primary MGP operations area	6	0-3	✓			✓					Access only
				3-6	✓			✓					
Shallow Test Pit	TP-02	Characterize shoreline fill material and evaluate shallow soil quality at the top of the bluff on the northern edge of the primary MGP operations area	6	0-3	✓		✓			✓	✓	✓	Access only
				3-6	✓		✓			✓	✓✓	✓✓	
Shallow Test Pit	TP-03	Characterize shoreline fill material and evaluate shallow soil quality at the top of the bluff on the northern edge of the primary MGP operations area	6	0-3	✓			✓					Access only
				3-6	✓			✓					
Shallow Test Pit	TP-04	Evaluate shallow soil quality in the former petroleum storage area	6	0-3	✓			✓					May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓					
Shallow Test Pit	TP-05	Evaluate shallow soil quality in the former petroleum storage area	6	0-3	✓			✓					May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓					
Shallow Test Pit	TP-06	Evaluate shallow soil quality in the former petroleum storage area	6	0-3	✓			✓					May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓					
Shallow Test Pit	TP-07	Evaluate shallow soil quality in the former petroleum storage area	6	0-3	✓			✓					May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓					
Shallow Test Pit	TP-08	Evaluate shallow soil quality in the former petroleum storage area in the vicinity of the residue cistern	6	0-3	✓			✓					May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓					
Shallow Test Pit	TP-09	Evaluate shallow soil quality in the vicinity of the former tar wells	6	0-3	✓		✓			✓			May be modified based on the geophysical surveys if underground features are identified
				3-6	✓		✓			✓			
Shallow Test Pit	TP-10	Evaluate shallow soil quality in the vicinity of the former purifiers	6	0-3	✓		✓		✓	✓	✓	✓	May be modified based on the geophysical surveys if underground features are identified
				3-6	✓		✓		✓	✓	✓✓	✓✓	

Table A-4. Soil Sampling and Analysis Approach – Shallow Soil Investigation

Bremerton Gas Works Site
Bremerton, Washington

Exploration Type	Exploration Identification	Primary Exploration Objective	Target Exploration Depth (feet bgs)[1]	Sample Depth (feet bgs)[1]	Soil Sample Chemical Analysis: VOCs Full List	VOCs BTEX	SVOCs Full List	SVOCs PAHs	Cyanide	Metals[2]	Pesticides	PCBs	Location Modification Decision Criteria
Shallow Test Pit	TP-11	Evaluate shallow soil quality in the former finished gas and/or byproduct storage tanks area	6	0-3	✓			✓					May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓					
Shallow Test Pit	TP-12	Evaluate shallow soil quality in the former finished gas and/or byproduct storage tanks area	6	0-3	✓		✓			✓	✓	✓	May be modified based on the geophysical surveys if underground features are identified
				3-6	✓		✓			✓	✓✓	✓✓	
Shallow Test Pit	TP-13	Evaluate shallow soil quality at the eastern edge of the primary MGP operations area and at the western edge of the ravine fill area	6	0-3	✓			✓	✓				May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓	✓				
Shallow Test Pit	TP-14	Evaluate shallow soil quality at the eastern edge of the primary MGP operations area and at the western edge of the ravine fill area	6	0-3	✓			✓					May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓					
Shallow Test Pit	TP-15	Evaluate shallow soil quality at the western edge of the former bulk fuel storage area and along the former storm sewer and petroleum product lines and characterize shallow ravine fill	6	0-3	✓		✓			✓	✓	✓	May be modified based on the geophysical surveys if underground features are identified
				3-6	✓		✓			✓	✓✓	✓✓	
Shallow Test Pit	TP-16	Characterize shallow ravine fill and evaluate shallow soil quality near the former bulk fuel storage area and along the former storm sewer and petroleum product lines	6	0-3	✓			✓					May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓					
Shallow Test Pit	TP-17	Characterize shallow ravine fill	6	0-3	✓		✓		✓	✓	✓	✓	May be modified based on the geophysical surveys if underground features are identified
				3-6	✓		✓		✓	✓	✓✓	✓✓	
Shallow Test Pit	TP-18	Characterize shallow ravine fill and evaluate shallow soil quality near the former storm sewer and petroleum product lines	6	0-3	✓			✓					May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓					
Shallow Test Pit	TP-19	Characterize shallow ravein fil and evalute shallow soil quality on the eastern portion of the Sesko Property	6	0-3	✓			✓					May be modified based on the geophysical surveys if underground features are identified
				3-6	✓			✓					
Shallow Test Pit	TP-20	Characterize shoreline fill material and evalaute shallow soil quality at the top of the bluff on the northern edge of the primary MGP operations area	6	0-3	✓		✓			✓	✓	✓	Access only
				3-6	✓		✓			✓	✓✓	✓✓	
Shallow Test Pit	TP-21	Characterize shallow soil quality in the former vicinity of the Gas Holder and Scrubber	6	0-3	✓		✓			✓	✓	✓	May be modified based on the geophysical surveys if underground features are identified
				3-6	✓		✓			✓	✓✓	✓✓	

Table A-4. Soil Sampling and Analysis Approach – Shallow Soil Investigation

Bremerton Gas Works Site
Bremerton, Washington

Exploration Type	Exploration Identification	Primary Exploration Objective	Target Exploration Depth (feet bgs)[1]	Sample Depth (feet bgs)[1]	Soil Sample Chemical Analysis: VOCs Full List	VOCs BTEX	SVOCs Full List	SVOCs PAHs	Cyanide	Metals[2]	Pesticides	PCBs	Location Modification Decision Criteria
Shallow Test Pit	TP-22	Characterize shallow soil quality and ravine fill material on the eastern side of the Sesko Property	6	0-3	✓		✓			✓	✓	✓	Access only
				3-6	✓		✓			✓	✓✓	✓✓	
Shallow Test Pit	TP-23	Characterize shallow soil quality and ravine fill material on the eastern side of the Sesko Property	6	0-3	✓			✓					Access only
				3-6	✓			✓					
Shallow Test Pit	TP-24	Characterize shoreline fill material and evalaute shallow soil quality at the top of the bluff/ravine fill on the northeast side of the primary MGP operations area	6	0-3	✓		✓		✓	✓	✓	✓	Access only
				3-6	✓		✓		✓	✓	✓✓	✓✓	
Shallow Test Pit	TP-25	Characterize shoreline fill material and evalaute shallow soil quality at the top of the bluff on the northeast side of the primary MGP operations area	6	0-3	✓			✓					Access only
				3-6	✓			✓					
Shallow Test Pit	TP-26	Characterize shallow soil quality in the vicinity of the drip tank and the manufactured gas distribution line	6	0-3	✓			✓					May be modified based on the results of the geophysical surveys to be located south of any identified/suspected manufactured gas piping and/or the Drip Tank
				3-6	✓			✓					
Shallow Test Pit	TP-27	Characterize shallow soil quality beneath the former coal/coke briquette storage slab	6	0-3	✓		✓			✓	✓	✓	Access only
				3-6	✓		✓			✓	✓✓	✓✓	
Shallow Test Pit	TP-28	Characterize shallow soil quality in the vicinity of piping connections to finished gas storage tanks	6	0-3	✓		✓			✓			Access only
				3-6	✓		✓			✓			
Shallow Soil Boring	SB-01	Evaluate shallow soil quality adjacent to the former coal/coke briquette storage area	16	0-4	✓✓			✓					Access or refusal only
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-02	Evaluate shallow soil quality adjacent to the former coal/coke briquette storage area	16	0-4	✓✓			✓					Access or refusal only
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-03	Evaluate shallow soil quality near the former gas distribution piping	16	0-4	✓✓			✓			✓	✓	May be modified based on the geophyscial surveys if piping location is identified
				4-8	✓✓			✓			✓✓	✓✓	
				8-12									
				12-16	✓✓			✓			✓✓	✓✓	
Shallow Soil Boring	SB-04	Evaluate shallow soil quality near the former Gas Works driveway, west of the gas storage tanks, and in area currently used for light industrial operations	16	0-4	✓✓			✓					Access or refusal only
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					

Table A-4. Soil Sampling and Analysis Approach – Shallow Soil Investigation

Bremerton Gas Works Site
Bremerton, Washington

Exploration Type	Exploration Identification	Primary Exploration Objective	Target Exploration Depth (feet bgs)[1]	Sample Depth (feet bgs)[1]	Soil Sample Chemical Analysis: VOCs Full List	VOCs BTEX	SVOCs Full List	SVOCs PAHs	Cyanide	Metals[2]	Pesticides	PCBs	Location Modification Decision Criteria
Shallow Soil Boring	SB-05	Evaluate shallow soil quality and investigate the presence of NAPL in the area of the reported former tar pit	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if subsurface anomalies are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-06	Evaluate shallow soil quality and investigate the presence of NAPL in the area of the reported former tar pit	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if subsurface anomalies are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-07	Evaluate shallow soil quality and investigate the presence of NAPL in the area of the reported former tar pit	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if subsurface anomalies are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-08	Evaluate shallow soil quality and investigate the presence of NAPL in the area of the reported former tar pit	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if subsurface anomalies are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-09	Evaluate shallow soil quality and investigate the presence of NAPL in the area of the reported former tar pit	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if subsurface anomalies are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-10	Evaluate shallow soil quality south of the primary former MGP operations area and in the approximate vicinity of the petroleum product line	16	0-4	✓✓			✓					May be modified based on the geophsyical surveys if the petroleum product line location can be identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-11	Evaluate shallow soil quality south of the primary former MGP operations area and in the approximate vicinity of the petroleum product line	16	0-4	✓✓			✓			✓	✓	May be modified based on the geophsyical surveys if the petroleum product line location can be identified
				4-8	✓✓			✓			✓✓	✓✓	
				8-12									
				12-16	✓✓			✓			✓✓	✓✓	
Shallow Soil Boring	SB-12	Evaluate shallow soil quality south of the primary former MGP operations area and in the approximate vicinity of the petroleum product line	16	0-4	✓✓			✓					May be modified based on the geophsyical surveys if the petroleum product line location can be identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-13	Evaluate shallow soil quality in the vicinity of the drip tank along the manufactured gas distribution line	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if the manufactured gas distribution line and/or drip tank locations can be identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-14	Evaluate shallow soil quality south of the primary former MGP operations area	16	0-4	✓✓			✓					Access or refusal only
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					

Table A-4. Soil Sampling and Analysis Approach – Shallow Soil Investigation

Bremerton Gas Works Site
Bremerton, Washington

Exploration Type	Exploration Identification	Primary Exploration Objective	Target Exploration Depth (feet bgs)[1]	Sample Depth (feet bgs)[1]	Soil Sample Chemical Analysis: VOCs Full List	VOCs BTEX	SVOCs Full List	SVOCs PAHs	Cyanide	Metals[2]	Pesticides	PCBs	Location Modification Decision Criteria
Shallow Soil Boring	SB-15	Evaluate shallow soil quality south of the primary former MGP operations area	16	0-4	✓✓			✓					Access or refusal only
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-16	Evaluate shallow soil quality near the finished gas storage and/or byproduct storage tanks and distribution piping	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if underground features are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-17	Evaluate shallow soil quality in the vicinity of the drip tank along the manufactured gas distribution line	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if the manufactured gas distribution line and/or drip tank locations can be identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-18	Evaluate shallow soil quality in the primary former MGP opertions area, specifically, near the former gas holder	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if underground features are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-19	Evaluate shallow soil quality in the primary former MGP operations area, specifically, near the former furnaces	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if underground features are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-20	Evaluate shallow soil quality in the primary former MGP operations area, specifically, near the former furnaces and process piping	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if underground features are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-21	Evaluate shallow soil quality in the primary former MGP opertions area, specifically near the former gas holder	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if underground features are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-22	Evaluate shallow soil quality in the primary former MGP opertions area, specifically near the former gas holder	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if underground features are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-23	Evaluate shallow soil quality in the primary former MGP operations area, between the finished gas and/or byproduct storage tanks and the ravine	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if underground features are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					

Table A-4. Soil Sampling and Analysis Approach – Shallow Soil Investigation

Bremerton Gas Works Site
Bremerton, Washington

Exploration Type	Exploration Identification	Primary Exploration Objective	Target Exploration Depth (feet bgs)[1]	Sample Depth (feet bgs)[1]	Soil Sample Chemical Analysis: VOCs Full List	VOCs BTEX	SVOCs Full List	SVOCs PAHs	Cyanide	Metals[2]	Pesticides	PCBs	Location Modification Decision Criteria
Shallow Soil Boring	SB-24	Evaluate shallow soil quality in the primary former MGP operations area, between the finished gas and/or byproduct storage tanks and the ravine	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if underground features are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-25	Evaluate shallow soil quality near the eastern edge of the former MGP operations area and in the vicinity of petroleum product piping	16	0-4	✓✓			✓					May be modified based on the geophysical surveys if underground features are identified
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-26	Evaluate shallow soil quality to the south of the former bulk fuel storage area	16	0-4	✓✓			✓					Access or refusal only
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-27	Evaluate shallow soil quality to the south of the former bulk fuel storage area	16	0-4	✓✓			✓					Access or refusal only
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-28	Evaluate shallow soil quality to the north of the former bulk fuel storage area	16	0-4	✓✓			✓					Access or refusal only
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-29	Evaluate shallow soil quality to the north of the former bulk fuel storage area	16	0-4	✓✓			✓					Access or refusal only
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					
Shallow Soil Boring	SB-30	Evaluate shallow soil quality near the former coal/coke briquette storage area and at the western edge of the former MGP operations area	16	0-4	✓✓			✓					Access or refusal only
				4-8	✓✓			✓					
				8-12									
				12-16	✓✓			✓					

Notes: BTEX = benzene, toluene, ethylbenzene and xylenes
PAHs = polycyclic aromatic hydrocarbons
SVOCs = semivolatile organic compounds
TBD = to be determined
VOCs = volatile organic compounds
✓ = Indicates planned chemical analysis

✓✓ = Indicates contingent chemical analysis. For VOCs: Soil samples collected from the shallow soil borings will be submitted for analysis of the full list of VOCs if elevated levels of volatile organic vapors are identified through field screening using the photoionization detector. For Pesticides and PCBs: Deeper soil samples will be submitted for analysis of pesticides or PCBs if those contaminants are detected in shallow soil samples from the same sample location.

1 Target exploration and sample depth in feet below ground surface (bgs)
2 Metals include antimony, arsenic, cadmium, total chromium, cobalt, copper, lead, manganese, nickel, thallium, vanadium and zinc.

Table A-5. Proposed Exploration Location Coordinates
Bremerton Gas Works Site
Bremerton, Washington

Exploration Identification	Exploration Type	X-coordinate	Y-coordinate
TP-01	Test Pit	1193701.2944	216266.6050
TP-02	Test Pit	1193736.0166	216261.9175
TP-03	Test Pit	1193772.3013	216260.7022
TP-04	Test Pit	1193816.2250	216241.4314
TP-05	Test Pit	1193851.2944	216224.4175
TP-06	Test Pit	1193875.2527	216200.9800
TP-07	Test Pit	1193875.0791	216184.1397
TP-08	Test Pit	1193875.6000	216164.8689
TP-09	Test Pit	1193849.9923	216156.2751
TP-10	Test Pit	1193813.3170	216146.7265
TP-11	Test Pit	1193809.1937	216113.8706
TP-12	Test Pit	1193808.7597	216057.8810
TP-13	Test Pit	1193872.3448	216114.3915
TP-14	Test Pit	1193871.2597	216080.9713
TP-15	Test Pit	1193885.5826	216048.4192
TP-16	Test Pit	1193908.5861	216062.9592
TP-17	Test Pit	1193912.5971	216129.4160
TP-18	Test Pit	1193939.6191	216097.8984
TP-19	Test Pit	1193955.0270	216064.4783
TP-20	Test Pit	1193833.9333	216263.3064
TP-21	Test Pit	1193815.0097	216202.6293
TP-22	Test Pit	1193956.9802	216123.9401
TP-23	Test Pit	1193972.1711	216157.7942
TP-24	Test Pit	1193910.1052	216194.9470
TP-25	Test Pit	1193901.5982	216222.5512
TP-26	Test Pit	1193758.2388	215943.2977
TP-27	Test Pit	1193736.8847	216211.5269
TP-28	Test Pit	1193777.5270	216110.6082
SB-01	Shallow Soil Boring	1193711.8534	216212.4404
SB-02	Shallow Soil Boring	1193735.8118	216162.7876
SB-03	Shallow Soil Boring	1193736.5062	216133.6209
SB-04	Shallow Soil Boring	1193742.0618	216083.2737
SB-05	Shallow Soil Boring	1193740.6729	216052.7181
SB-06	Shallow Soil Boring	1193729.4967	216033.3171
SB-07	Shallow Soil Boring	1193742.1920	216032.9916
SB-08	Shallow Soil Boring	1193752.5001	216033.5341
SB-09	Shallow Soil Boring	1193740.4559	216013.4603
SB-10	Shallow Soil Boring	1193730.4298	215978.8683
SB-11	Shallow Soil Boring	1193781.6451	215977.3058
SB-12	Shallow Soil Boring	1193833.5548	215977.3058
SB-13	Shallow Soil Boring	1193767.6173	215942.4100
SB-14	Shallow Soil Boring	1193785.0522	216012.2667
SB-15	Shallow Soil Boring	1193839.3057	216014.3284
SB-16	Shallow Soil Boring	1193777.4263	216080.5755
SB-17	Shallow Soil Boring	1193789.4923	215942.1206
SB-18	Shallow Soil Boring	1193796.5236	216178.6658
SB-19	Shallow Soil Boring	1193761.1503	216217.2942

Table A-5. Proposed Exploration Location Coordinates
Bremerton Gas Works Site
Bremerton, Washington

SB-20	Shallow Soil Boring	1193786.9750	216209.0477
SB-21	Shallow Soil Boring	1193834.7180	216206.0095
SB-22	Shallow Soil Boring	1193838.8413	216171.0703
SB-23	Shallow Soil Boring	1193840.5774	216113.7786
SB-24	Shallow Soil Boring	1193838.8413	216059.0911
SB-25	Shallow Soil Boring	1193882.2007	216017.3810
SB-26	Shallow Soil Boring	1193886.1069	215976.4956
SB-27	Shallow Soil Boring	1193941.5757	215974.6727
SB-28	Shallow Soil Boring	1193931.9402	216038.9956
SB-29	Shallow Soil Boring	1193909.2840	216040.0373
SB-30	Shallow Soil Boring	1193697.2054	216158.5156
MW-101-X	Deep Monitoring Well	1193772.3562	215923.1269
MW-102-X	Deep Monitoring Well	1193732.4256	216262.4498
MW-103-X	Deep Monitoring Well	1193826.6096	216254.2033
MW-104-X	Deep Monitoring Well	1193881.2971	216227.7276
MW-105-X	Deep Monitoring Well	1193936.4187	216159.1512
MW-9WT	Shallow Monitoring Well	1193691.6270	216250.2103
MW-10WT	Shallow Monitoring Well	1193689.5437	216130.4186
MW-11WT	Shallow Monitoring Well	1193690.0645	216034.0644
MW-12WT	Shallow Monitoring Well	1193766.1062	215923.1269
MW-13WT	Shallow Monitoring Well	1193879.1270	215954.3769
MW-14WT	Shallow Monitoring Well	1193989.0228	216036.1478
MW-15WT	Shallow Monitoring Well	1193946.8353	216162.1894

Notes:
Coordinate system is NAD83 State Plane North, feet

Table A-6 - Soil Sampling and Analysis Approach – Deep Soil and Groundwater Investigation

Bremerton Gas Works Site
Bremerton, Washington

Exploration Type	Exploration Identification	Primary Exploration Objective	Target Exploration Depth (feet bgs)[1]	Sample Depth[2]	Soil Sample Analysis: VOCs	Soil Sample Analysis: PAHs	Soil Sample Analysis: Physical Properties[3]	Location Modification Decision Criteria
Deep Boring/Well	MW-101-X	Evaluate deep soil quality, charactierize deep lithology, evaluate soil for the presence of NAPL, define water-bearing zone(s) and aquitard(s)	TBD (minimum 75)	Fill	✓	✓		May be modified based on the results of the geophysical surveys to be located south of any identified/suspected manufactured gas piping and/or the Drip Tank
				Vadose Zone	✓	✓		
				Saturated WT	✓	✓		
				Deep WT/Aquitard	✓	✓		
				Other	✓	✓		
Deep Boring/Well	MW-102-X	Evaluate deep soil quality, charactierize deep lithology including vertical extent of shoreline fill, evaluate soil for the presence of NAPL, define water-bearing zone(s) and aquitard(s)	TBD (minimum 75)	Fill	✓	✓		Access only
				Vadose Zone	✓	✓		
				Saturated WT	✓	✓		
				Deep WT/Aquitard	✓	✓		
				Other	✓	✓		
Deep Boring/Well	MW-103-X	Evaluate deep soil quality, charactierize deep lithology including vertical extent of shoreline fill, evaluate soil for the presence of NAPL, define water-bearing zone(s) and aquitard(s)	TBD (minimum 75)	Fill	✓	✓		Access only
				Vadose Zone	✓	✓		
				Saturated WT	✓	✓		
				Deep WT/Aquitard	✓	✓		
				Other	✓	✓		
Deep Boring/Well	MW-104-X	Evaluate deep soil quality, charactierize deep lithology including vertical extent of shoreline/ravine fill, evaluate soil for the presence of NAPL, define water-bearing zone(s) and aquitard(s)	TBD (minimum 75)	Fill	✓	✓		Access only
				Vadose Zone	✓	✓		
				Saturated WT	✓	✓		
				Deep WT/Aquitard	✓	✓		
				Other	✓	✓		
Deep Boring/Well	MW-105-X	Evaluate deep soil quality, charactierize deep lithology including vertical extent of ravine fill, evaluate soil for the presence of NAPL, define water-bearing zone(s) and aquitard(s)	TBD (minimum 55)	Fill	✓	✓		May be modified based on the results of the geophysical surveys
				Vadose Zone	✓	✓		
				Saturated WT	✓	✓		
				Deep WT/Aquitard	✓	✓		
				Other	✓	✓		
Deep Boring/Well	MW-9WT	Evaluate lateral extent of COPCs in soil, characterize deep lithology including nature and vertical extent of shoreline fill, if present, evaluate soil for the presence of NAPL, define characteristics of shallow water-bearing zone	45	Fill	✓	✓		Access only
				Vadose Native	✓	✓		
				Saturated Native	✓	✓		
Deep Boring/Well	MW-10WT	Evaluate lateral extent of COPCs in soil, characterize deep lithology, evaluate soil for the presence of NAPL, define characteristics of shallow water-bearing zone	45	Fill	✓	✓		Access only
				Vadose Native	✓	✓		
				Saturated Native	✓	✓		
Deep Boring/Well	MW-11WT	Evaluate lateral extent of COPCs in soil, characterize deep lithology, evaluate soil for the presence of NAPL, define characteristics of shallow water-bearing zone	45	Fill	✓	✓		Access only
				Vadose Native	✓	✓		
				Saturated Native	✓	✓		

Table A-6 - Soil Sampling and Analysis Approach – Deep Soil and Groundwater Investigation

Bremerton Gas Works Site
Bremerton, Washington

Exploration Type	Exploration Identification	Primary Exploration Objective	Target Exploration Depth (feet bgs)[1]	Sample Depth[2]	Soil Sample Analysis			Location Modification Decision Criteria
					VOCs	PAHs	Physical Properties[3]	
Deep Boring/Well	MW-12WT	Evaluate lateral extent of COPCs in soil, characterize deep lithology, evaluate soil for the presence of NAPL, define characteristics of shallow water-bearing zone	45	Fill	✓	✓		May be modified based on the results of the geophysical surveys to be located south of any identified/suspected manufactured gas piping and/or the Drip Tank
				Vadose Native	✓	✓		
				Saturated Native	✓	✓		
Deep Boring/Well	MW-13WT	Evaluate lateral extent of COPCs in soil, characterize deep lithology, evaluate soil for the presence of NAPL, define characteristics of shallow water-bearing zone	45	Fill	✓	✓		Access only
				Vadose Native	✓	✓		
				Saturated Native	✓	✓		
Deep Boring/Well	MW-14WT	Evaluate lateral extent of COPCs in soil, characterize deep lithology, evaluate soil for the presence of NAPL, define characteristics of shallow water-bearing zone	45	Fill	✓	✓		Access only
				Vadose Native	✓	✓		
				Saturated Native	✓	✓		
Deep Boring/Well	MW-15WT	Evaluate lateral extent of COPCs in soil, characterize deep lithology and nature of ravine fill, evaluate soil for the presence of NAPL, define characteristics of shallow water-bearing zone	45	Fill	✓	✓		May be modified based on the results of the geophysical surveys
				Vadose Native	✓	✓		
				Saturated Native	✓	✓		
Deep Boring/Well	MW-16WT	Locations to be identified, in consultation with EPA, based on the results of the shallow soil investigaton to characterize groundwater in the interior of the Upland ISA in the vicinity of identified sources of	45	To be determined, as necessary to address data gaps to meet the objectives of the deep soil and groundwater investigation				
	MW-17WT		45					
	MW-18WT		45					
	MW-19WT		45					

Notes: BTEX = benzene, toluene, ethylbenzene and xylenes
PAHs = polycyclic aromatic hydrocarbons
SVOCs = semivolatile organic compounds
TBD = to be determined
VOCs = volatile organic compounds
1 Target exploration depth in feet below ground surface (bgs). May be modified to target potential contaminated zones based on field observations.
2 Soil samples will be collected from these borings for chemical and physical analysis to meet the objectives of the deep soil and groundwater investigation. Sample collection depth will depend on field soil classification and observations of contamination at the time of drilling.
3 Physical properties analysis consists of total organic carbon (TOC), grainsize, and Atterberg Limits

Table A-7. Groundwater Sampling and Analysis Approach

Bremerton Gas Works Site
Bremerton, Washington

Monitoring Well Identification	New or Existing Monitoring Well	Total Depth (feet bgs)	Screen Length	Groundwater Sample Chemical Analyses					MNA Parameters[2]	Field Parameters[3]
				VOCs	SVOCs	PAHs	Cyanide	Metals[1]		
MW-01	Existing	45	15	✓	✓	✓	✓	✓	To be determined	✓
MW-02	Existing	45	15	✓	✓	✓	✓	✓		✓
MW-03	Existing	45	15	✓	✓	✓	✓	✓		✓
MW-04	Existing	40	20	✓	✓	✓	✓	✓		✓
MW-05	Existing	20	15	✓	✓	✓	✓	✓		✓
MW-06	Existing	35	20	✓	✓	✓	✓	✓		✓
MW-07	Existing	35	20	✓	✓	✓	✓	✓		✓
MW-08	Existing	40	20	✓	✓	✓	✓	✓		✓
MP04	Existing	40	10	✓	✓	✓	✓	✓		✓
SP02	Existing	35	10	✓	✓	✓	✓	✓		✓
MW-101-X	New	TBD	10	✓	✓	✓	✓	✓		✓
MW-102-X	New	TBD	10	✓	✓	✓	✓	✓		✓
MW-103-X	New	TBD	10	✓	✓	✓	✓	✓		✓
MW-104-X	New	TBD	10	✓	✓	✓	✓	✓		✓
MW-105-X	New	TBD	10	✓	✓	✓	✓	✓		✓
MW-9WT	New	50	15	✓	✓	✓	✓	✓		✓
MW-10WT	New	50	15	✓	✓	✓	✓	✓		✓
MW-11WT	New	50	15	✓	✓	✓	✓	✓		✓
MW-12WT	New	50	15	✓	✓	✓	✓	✓		✓
MW-13WT	New	50	15	✓	✓	✓	✓	✓		✓
MW-14WT	New	50	15	✓	✓	✓	✓	✓		✓
MW-15WT	New	50	15	✓	✓	✓	✓	✓		✓
MW-16WT	New	To be determined		✓	✓	✓	✓	✓		✓
MW-17WT	New			✓	✓	✓	✓	✓		✓
MW-18WT	New			✓	✓	✓	✓	✓		✓
MW-19WT	New			✓	✓	✓	✓	✓		✓

Notes: BTEX = benzene, toluene, ethylbenzene, and xylenes
PAHs = polycyclic aromatic hydrocarbons
SVOCs = semivolatile organic compounds
TBD = to be determined
VOCs = volatile organic compounds

1 Metals include antimony, arsenic, cadmium, total chromium, hexavalent chromium, cobalt, copper, lead, manganese, nickel, thallium, vanadium, and zinc.

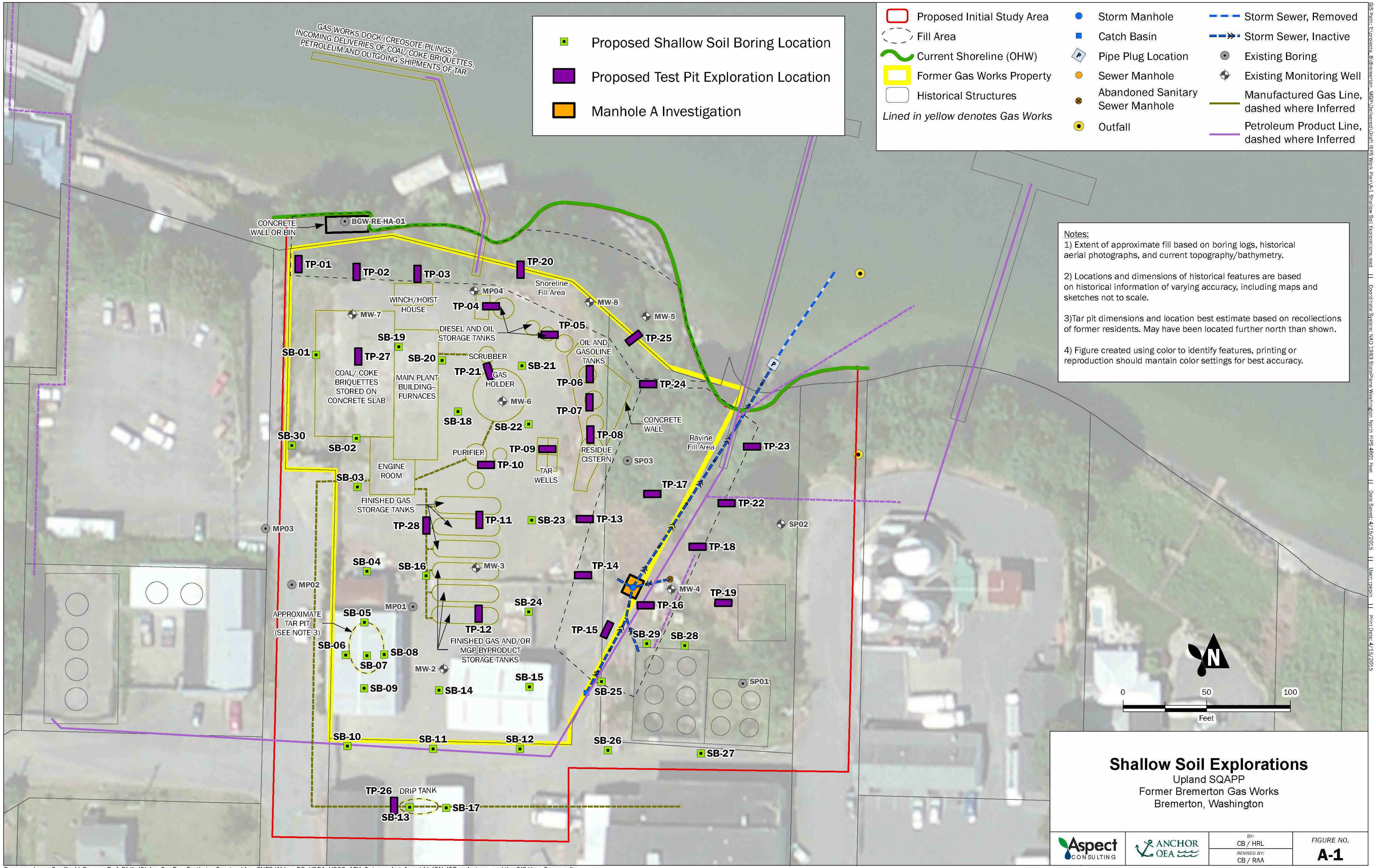
2 Monitored Natural Attenuation (MNA) parameters, including dissolved organic carbon, nitrate, nitrite, sulfate, sulfide, ferrous iron, dissolved manganese, and alkalinity, will be included in the analysis for a subset of these wells, to be determined based on the final well construction and lcoations.

3 Field parameters consist of oxidation-reduction potential (Eh), dissolved oxygen, conductivity, temperature and pH.

Table A-8. Analytical Methods, Sample Containers, Preservation, and Holding Times Bremerton Gas Works Site
Bremerton, Washington

Sample Matrix	Analytical Parameter	Analytical Method	Sample Container	No. Containers	Preservation Requirements	Holding Time
Soil	Petroleum Hydrocarbon Identification	NWTPH-HCID	8 ounce jar	1	4°C ±2°C	14 days for extraction; 40 days for analysis
	VOCs	Method 8260C	Method 5035A, 40-ml vials, 2 ounce jar	5	4°C ±2°C, Freeze within 48 hours to <-7°C, Methanol, Sodium Bisulfate	14 days
	Low-level PAHs	Method 8270D-SIM	8 ounce jar	1	4°C ±2°C	14 days for extraction; 40 days for analysis
	Metals	Method 200.8/7471A	4 ounce jar	1	4°C ±2°C	6 months, Hg-28 days
	SVOCs	Method 8270D	8 ounce jar	1	4°C ±2°C	14 days for extraction; 40 days
	Pesticides	Method 8081B	8 ounce jar	1	4°C ±2°C	14 days for extraction; 40 days
	PCBs	Method 8082	8 ounce jar	1	4°C ±2°C	14 days for extraction; 40 days
	Cyanide	Method 9012	4 ounce jar	1	4°C ±2°C	14 days
	Grain Size	ASTM D422	8 ounce jar	4	none	n/a
	Atterberg Limits	ASTM D4318	8 ounce jar	2	none	n/a
	Total Organic Carbon	Plumb	4 ounce jar	1	4°C ±2°C	14 days
Groundwater	Petroleum Hydrocarbon Identification	NWTPH-HCID	500-mL Amber Glass, 40-mL VOA vial	2 ea	4°C ±2°C, HCl	7 days for extraction, 40 days for analysis
	VOCs	Method 8260C	40-mL VOA Vials	3	4°C ±2°C, 2 with HCl pH < 2, 2 without HCl	14 days for analysis
	Low-level PAHs	Method 8270D-SIM	500-mL Amber Glass	2	4°C ±2°C	7 days for extraction, 40 days for analysis
	SVOCs with low-level PAHs	Method 8270D	500-mL Amber Glass	2	4°C ±2°C	7 days for extraction, 40 days for analysis
	Metals, total/dissolved (field filter)	Method 200.7/200.8	500-mL HDPE	1	4°C ±2°C, HNO3 pH < 2 (after filtration)	180 days
	Dissolved Sulfide	Method 376.2	500-mL HDPE	1	4°C ±2°C, Zinc Acetate and NaOH pH > 9 (after filtration)	7 days
	Cyanide, Total	SM4500-CN	500-mL HDPE	1	NaOH, pH>12	14 days
	Dissolved Organic Carbon	SM5310B	250-mL Amber glass	1	H2SO4 ph<2, ≤6°C, (after filtration)	28 days
	Nitrogen as Nitrate	353.2/9056	500-mL HDPE	1	≤6°C	48 hours
	Nitrogen as Nitrite	353.2/9056	500-mL HDPE	1	≤6°C	48 hours
	Sulfate	300.0/9056	500-mL HDPE	1	≤6°C	28 days
	Manganese, dissolved	Method 200.7/200.8	500-mL HDPE	1	4°C ±2°C, HNO3 pH < 2 (after filtration)	180 days
	Alkalinity	SM 2320B-97	500-mL HDPE	1	≤6°C	14 days

FIGURES



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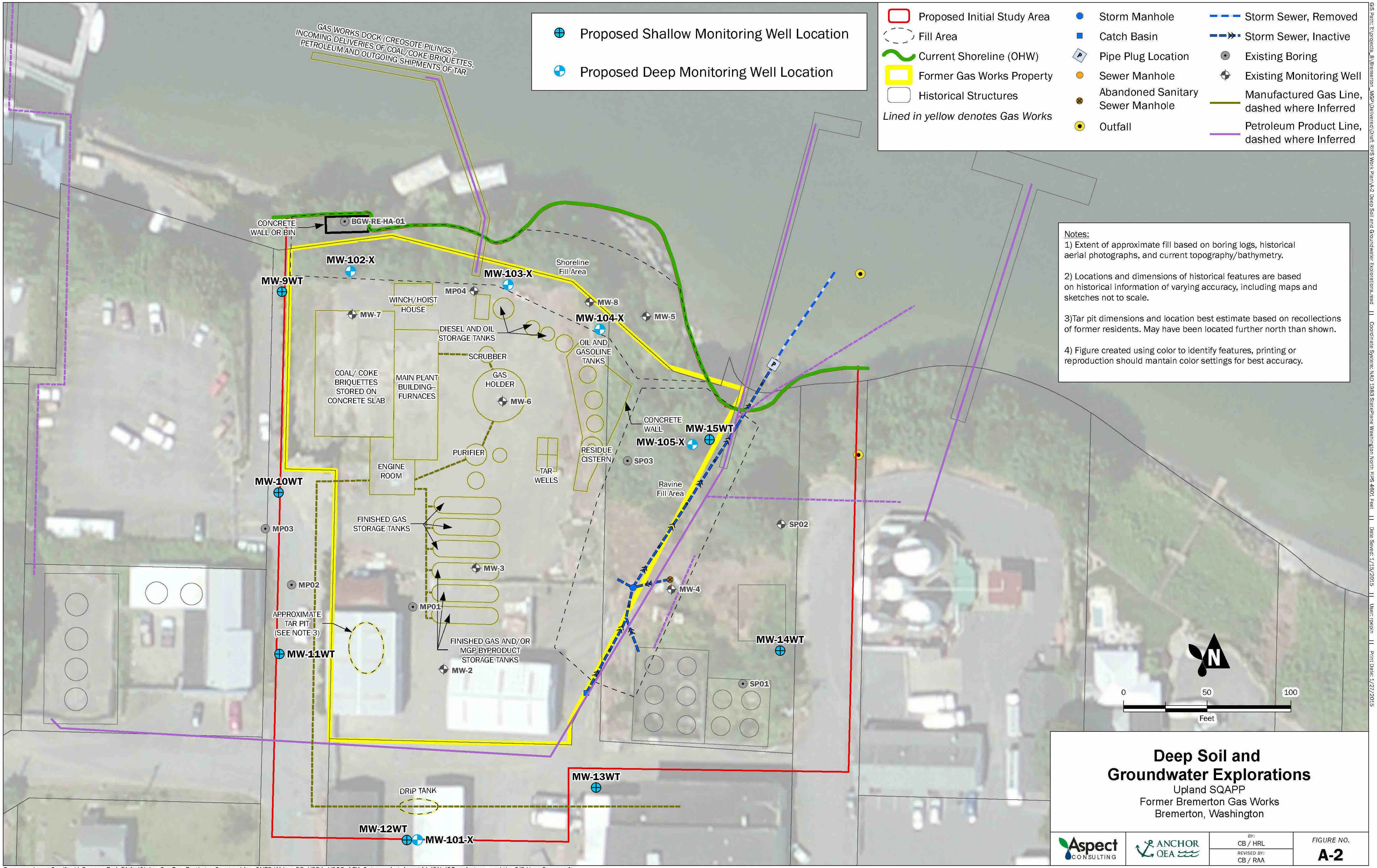


Deep Soil and Groundwater Explorations

Upland SQAPP
Former Bremerton Gas Works
Bremerton, Washington

Aspect CONSULTING | ANCHOR QEA | BY: CB / HRL | REVISED BY: CB / RAA | FIGURE NO. A-2

Basemap Layer Credits || Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

ATTACHMENT A

Aspect CONSULTING

BORING LOG

SHEET ______OF _______

LOCATION OF BORING	PROJECT NO.	BORING NO.
	PROJECT NAME	
SKETCH OF LOCATION	DRILLING METHOD:	
	LOGGED BY:	
	DRILLER:	
	SAMPLING METHOD:	
	HAMMER WEIGHT/SAMPLER DIAMETER	
	OBSERVATION WELL INSTALL YES _____ NO _____	START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	
	DATE	DATE / DATE
DATUM / GRADE ELEV.	CASING DEPTH	

SIZE (%) GRAVEL	SAND (SIZE RANGE)	FINES	SAMPLE NO. / SAMPLE TYPE	SAMPLE DEPTH	INCHES DRIVEN / INCHES RECV'D	DEPTH IN FEET	PENETRATION RESISTANCE	USCS SUMMARY	SURFACE CONDITION DESCRIPTION: Density, moisture, color, minor, MAJOR CONSTITUENT. NON-SOIL SUBSTANCES: Odor, staining, sheen, scrap, slag, etc. DRILL ACTION
						1			
						2			
						3			
						4			
						5			
						6			
						7			
						8			
						9			
						0			
						1			
						2			
						3			
						4			
						5			
						6			
						7			
						8			
						9			
						0			

Aspect CONSULTING

GROUNDWATER SAMPLING RECORD	WELL NUMBER: _______	Page:____ of ____

Project Name: ______________________________ Project Number: ______________________________

Date: ____________________

Developed by: ______________________________

Measuring Point of Well: ______________________________

Screened Interval (ft. TOC) ______________________________

Filter Pack Interval (ft. TOC) ______________________________

Starting Water Level (ft TOC): ______________

Casing Stickup (ft): ______________

Total Depth (ft TOC): ______________

Casing Diameter (inches): ______________

Casing Volume ________ (ft Water) x ________ (Lpfv)(gpf) = ________ (L)(gal)

Casing volumes: 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf

2" = 0.62 Lpf 4" = 2.46 Lpf 6" = 5.56 Lpf

Sample Intake Depth (ft TOC): ________

PURGING MEASUREMENTS

Criteria:		Typical 0.1-0.5 Lpm	Stable and minimal and	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%	
Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp. (C or F)	Specific Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	pH	Eh ORP (mv)	Turbidity (NTU)	Comments

Total Gallons Purged: ______________________ Total Casing Volumes Removed: ____________

Ending Water Level (ft TOC): ______________________ Ending Total Depth (ft TOC): ____________

SAMPLE INVENTORY

Time	Volume	Bottle Type		Quantity	Filtration	Preservation	Appearance		Remarks
							Color	Turbidity & Sediment	

METHODS

Sampling Equipment with IDs: ______________________________

Purging Equipment: ______________________ Decon Equipment: ______________________

Disposal of Discharged Water: ______________________________

Observations/Comments: ______________________________

____

~~C:\Users\mmaison\Documents\Groundwater Sampling2~~

TEST PIT LOG

Aspect CONSULTING

TEST PIT ID ______________________

DATE ______________________

LOCATION OF TEST PIT	PROJECT NAME
SKETCH OF LOCATION	PROJECT NO.
	LOGGED BY
	CONTRACTOR
	TOTAL DEPTH
	DEPTH TO WATER

DEPTH IN FEET	SAMPLE DEPTH	SAMPLE ID	USCS SUMMARY	SOIL DESCRIPTION
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Aspect CONSULTING

350 Madison Avenue North
Bainbridge Island, Washington 98110
(206) 780-9370

401 Second Avenue S, Suite 201
Seattle, Washington 98104
(206) 328-7443

WELL DEVELOPMENT RECORD | **WELL NUMBER:** ________ | **Page:**____ **of** ____

Project Name: ______________________ Project Number: ______________ Date: ______________

Observor: Developed by: ______________________

Screened Interval (ft. BGS) ______________ Measuring Point on Well: ______________

Filter Pack Interval (ft. BGS) ______________ Casing Stickup (ft): ______________

Casing Size (in): ______Mtl & Scd ______ID (in) ______ Starting Water Level (ft TOC): ______________

Screen Size (in): ______Mtl & Scd ______ID (in) ______ Starting Total Depth (ft TOC): ______________

Screen Type: ______________________ Casing Volume ________ (ft water) x ________ (gpf) = ________ (gal)

Casing Volumes: 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf

DEVELOPMENT MEASUREMENTS

Time	Cumul. Vol. (gallons)	Purge Rate (gpm)	Temp.	Specific Conductance (umhos/cm)	pH	Turbidity	Imhoff Cone (ml/L)	Development Techniques

Total Gallons Removed: ______________ Ending Water Level (ft TOC): ______________

Total Casing Volumes Removed: ______________ Ending Total Depth (ft TOC): ______________

METHODS

Cleaning Equipment: ______________________

Development Equipment: ______________________

Disposal of Discharged Water: ______________________

Observations/Comments: ______________________

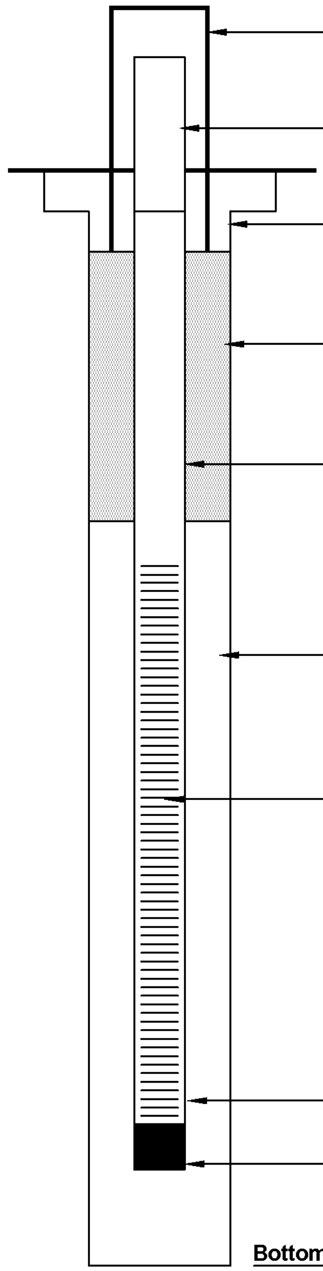
C:\Users\mmaisen\Documents\Well Development Record2

As-Built Well Completion Diagram

Project Number:	Boring/Monitoring Well Number: Sheet: of:
Project:	Location:
Elevation:	Drilling Contractor:
Drilling Method and Equipment Used:	Logged By:
Water Levels:	Completion Start: Finish:

Ecology Well ID ______________

Soil Type/ Depth | **Completion Depths**



Monument Type/Height ______________

Well Cap Type ______________

Surface Seal Material ______________

Seal Material ______________
(list NSF/ANSI certification)

Well Casing ID ______________

Type of Casing ______________

Type of Connection ______________

Filter Pack/Size ______________

Filter Pack Interval ______________

Well Screen ID ______________

Type of Screen ______________

Slot Size ______________

Screen Interval ______________

Centralizers ______________

Diameter of Borehole ______________

Sump ______________

Bottom of Boring ______________

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Materials Used:	Screen:
Sand:	Bentonite:
Blank:	Monument:
Concrete:	Other:

Q:_ACAD Standards\Standard Details\Well Diagram.dwg

DNR-00050076

ATTACHMENT B

Attachment B

Standard Operating Procedures

TABLE OF CONTENTS

B-1 STANDARD OPERATING PROCEDURE
FIELD DOCUMENTATION

1.0 OBJECTIVE

The objective of this SOP is to regulate field documentation generated during the field effort that will become part of the project file.

2.0 MATERIALS

- Field logbook/forms for each respective sampling type
- Waterproof pen
- Sample jars from prospective lab
- Waterproof labels for sample jars
- Daily log forms
- COCs (internal and external)
- Camera

3.0 PROCEDURES

Field Logbook and/or Forms

Field team members will keep a daily record of significant events, observations, and measurements in a field logbook or on field forms. All field activities will be recorded on forms specific to the collection activity and will be maintained by the Field Coordinator (FC). Field notes will be the main source of field documentation for all field activities. The on-site field representative will record all information pertinent to the investigation program. The sampling documentation will contain information on each sample collected, and will include at a minimum the following information:

- Project name
- Field personnel on site
- Facility visitors
- Weather conditions
- Field observations and any deviations from the Upland SQAPP
- Maps and/or drawings
- Date and time sample collected
- Sampling method and description of activities
- Identification or serial numbers of instruments or equipment used
- Deviations from the Upland SQAPP
- Conferences associated with field sampling activities

Entries for each day will begin on a new page or form. The person recording information must enter the date and time and initial each entry. Additional specific field reporting requirements and checklists for each study are defined in the respective SOPs. In general, sufficient information will be recorded during sampling so that reconstruction of the event can occur without relying on the memory of the field personnel.

The field notes will be taken on water-resistant, durable paper for adverse field conditions. Notes will be taken in indelible, waterproof blue or black ink. Errors will be corrected by crossing out with a single line, dating, and initialing. Each form will be marked with the project name, number, and date. The field forms will be scanned into Aspect's project file directory as convenient during the sampling event or upon completion of each sampling event.

B-2 STANDARD OPERATING PROCEDURE
DECONTAMINATION

1.0 OBJECTIVE

The objective of this SOP is to describe decontamination procedures to be followed during the performance of field activities.

2.0 MATERIALS

The following materials are required for performance of equipment decontamination:

- Scrub brush
- Alconox or equivalent soap
- Ethyl Acetate or Hexane
- De-ionized water
- Water buckets
- Health and safety equipment

3.0 PROCEDURES

The following steps will be taken during decontamination of equipment and materials that may affect sample quality:

1. Scrub with non-phosphate detergent
2. Rinse thoroughly with deionized water

In cases where product or oily sheen are encountered during sampling, the equipment and materials will also be decontaminated with a solvent rinse using ethyl acetate or hexane, followed by an additional rinse with deionized water.

4.0 NOTES

- Decontamination wastes will be disposed of according to project-specific considerations.
- Decontamination will be performed under level D health and safety procedures. Site-specific conditions may require additional health and safety precautions.

B-3 STANDARD OPERATING PROCEDURE
HANDLING OF INVESTIGATION-DERIVED WASTE

1.0 PURPOSE

Management of investigation-derived waste (IDW) minimizes the potential for the spread of hazardous waste on site or off site through investigation activities. The purpose of this SOP is to provide instructions for the proper management of contaminated materials derived from field investigations.

2.0 SCOPE

The procedures outlined are to be followed by all personnel who participate in site activities in areas where IDW is generated.

Materials that are known or suspected to be contaminated with hazardous substances through the actions of sample collection or personnel and equipment decontamination were said to be IDW. These wastes include decontamination solutions, disposable equipment, drill cuttings and fluids, and groundwater monitoring well development and purge waters. To the extent possible, the FC will attempt to minimize the generation of these wastes through careful design of decontamination schemes and groundwater sampling programs.

Testing conducted on soil and water investigation-derived wastes will show if they were also hazardous wastes as defined by Resource Conservation and Recovery Act (RCRA). This will determine the proper handling and ultimate disposal requirements.

The criteria for designating a substance as a hazardous waste, according to RCRA, are provided in 40 CFR 261.3. If IDW meet these criteria, RCRA requirements must be followed for packaging, labeling, transporting, storing and record keeping as described in 40 CFR 262 34. Those wastes judged to potentially meet the criteria for hazardous wastes, shall be stored in DOT-approved, 55-gallon steel drums.

3.0 INVESTIGATION-DERIVED WASTE MANAGEMENT

Procedures that minimize the potential for the spread of hazardous waste include minimizing the volume of waste generated, waste segregation, appropriate storage, and disposal, according to RCRA requirements.

Waste Minimization

Within the absolute constraints demanded by worker health and safety and project quality assurance/quality control (QA/QC), the generation of IDW is to be limited. In the development of the investigation work plan, each aspect of the investigation is to be reviewed to identify areas where excess waste generation can be eliminated. General procedures that will eliminate waste include avoidance of unnecessary exposure of materials to hazardous waste, and coordination of sampling schedules to avoid repetitious purging of wells and use of sampling equipment.

Waste Segregation

Waste storage and handling procedures to be used depend on the type of generated waste. For this reason, investigation-derived hazardous wastes described below will be segregated into separate, 55-gallon storage drums. Waste materials that are known to be free of hazardous waste contamination (such as broken sample bottles or equipment containers and wrappings), must be collected separately for disposal to municipal systems. Large plastic garbage or lawn and leaf bags are useful for collecting this trash.

Decontamination Solutions

Decontamination solutions are generated from washing and rinsing of personal protective equipment (PPE) and sampling equipment. Solutions considered investigation-derived wastes range from detergents, organic solvents, and acids used to decontaminate small hand samplers to steam cleaning rinsate used to wash drill rigs and other large equipment. These solutions are to be stored in 55-gallon drums with bolt-sealed lids.

Soil Cuttings and Drilling Mud

Soil cuttings are solid to semi-solid soils generated during trenching activities, drilling for the collection of subsurface soil samples, or the installation of monitoring wells. Depending on the type of drilling, drilling fluids known as “muds” may be used to remove soil cuttings. Drilling fluids flushed from boreholes must be directed into a settling section of a mud pit. This allows reuse of the decanted fluids after removal of the settled sediments. Drill cuttings, whether generated with or without drilling fluids, are to be removed with a flat-bottomed shovel and stored in 55-gallon drums with bolt-sealed lids.

Well Development and Purge Water

Well development and purge waters consists of groundwater removed from monitoring wells to repair damage to the aquifer following well installation, obtain characteristic aquifer groundwater samples, or measure aquifer hydraulic properties. The volume of groundwater to be generated will determine the appropriate storage procedure. These activities can generate significant volumes of groundwater depending on the well yield and the duration of the test or activity. Use of drums or large-volume, portable tanks such “Baker Tanks” should be considered for temporary storage of purge water.

Disposable Equipment

Disposable equipment includes used personal protective equipment such as Type coveralls, gloves, booties, and APR cartridges, and some inexpensive sampling equipment such as trowels or disposable bailers. This equipment will be disposed of as normal solid waste.

Waste Storage

The wastes that accumulate through investigations must be stored on site prior to disposal. An on-site waste staging area should be designated to provide secure and controlled storage for the drums.

Storage Containers

Containers shall be DOT-approved (DOT 17H 18/16GA OH unlined), open top, steel drums. The lids should lift completely off the drum, and be secured by a bolt ring. A sufficient number of drums should be ordered to store all anticipated waste, including extra drums for solid waste and decontamination water. Solid and liquid wastes are not to be mixed in the drums.

Pallets are often required to allow transport of filled drums to the staging area with a forklift. Normal pallets are 3 x 4 feet and will hold two to three, 55-gallon drums, depending on the filled weight. If pallets are required for drum transport or storage, Aspect

Consulting field personnel are responsible for ensuring that the empty drums are placed on pallets before they are filled and that the lids are sealed on the drums with the bolt tighten ring after the drums are filled.

Drum Labeling

Each drum that is used will be assigned a unique number that will remain with that drum for the life of the drum. This number will be written in permanent marker on the drum itself. Do not label drum lids. Drum labels shall contain the following information:

- Waste accumulation start date
- Well number or boring number, if applicable
- Drum number
- Contents matrix (soil, water. slurry, etc.)
- Generation location
- Project name

4.0 WASTE DISPOSAL

Final disposal of IDW will be determined after analytical results are received to identify if the waste material could designate as RCRA-hazardous waste.

B-4 STANDARD OPERATING PROCEDURE
LOW FLOW GROUNDWATER SAMPLING AND PURGING

1.0 PURPOSE

The objective of this SOP is to describe the protocols for conducting low-flow groundwater sampling and purging.

2.0 MATERIALS

- Project QAPP
- Groundwater Sampling Field Data Sheets and indelible ink pens
- Sample containers and labels as described in the project QAPP
- Insulated cooler(s) with ice
- Plastic Ziploc bags
- Bubble wrap
- Appropriate PPE and clothing as defined in the site Health and Safety Plan (HASP)
- Water level indicator
- Interface probe
- Pump and tubing appropriate to well construction
- YSI 556 for collection of field parameters
- Turbidimeter
- Groundwater filters (if necessary for dissolved metals analysis)
- Decontamination supplies:
  - Tap water
  - Deionized water
  - Alconox
  - Scrub brushes
  - Buckets, tubs, or similar
- COC forms

3.0 PRE-SAMPLING PREPARATION

When possible, prior to entering the field, begin filling out the Groundwater Sampling Field Data Sheets and sampling labels. This could include the project name, sampling location, and other standard information.

4.0 SAMPLING PROCEDURE

1. Don the required PPE as defined in the site HASP.
2. Prepare a decontamination area, if decontamination is required, in accordance with the Decontamination SOP.
3. Check the well for any damage or evidence of tampering and record the observations on the field data sheet.
4. Unlock and open the well monument and remove the well cap.
5. Measure and record the depth to water and record the measurement on the field data sheet. Measure water level from reference point to the nearest 0.01 foot. If sheen or oil is observed on the probe, determine presence/absence of NAPL with an interface probe. If NAPL is present, measure product thickness, and go to step 17 (no sample collected).
6. Attach and secure the dedicated tubing to the sampling pump. Lower the tubing or pump, depending on whether an aboveground (i.e. peristaltic) or in-well (i.e. submersible or bladder) pump is appropriate given the well construction and depth to water, slowly into the well. Be careful not to place the end of the tubing/pump intake on the bottom of the well because this may disturb any sediment present in the bottom of the well.
7. Start pumping the well by selecting the lowest pump speed. Ideally, the pump rate should equal the well recharge rate with little or no water level drawdown in the well (drawdown shall be 0.3 foot or less).
8. During purging, the ultimate low-flow rate should be from 0.1 to 0.5 liters per minute. Measure the pumping rate using a graduated cylinder and stop-watch or similar device. Record the pumping rate and depth to water on the field data sheet or in the logbook.
9. During purging, monitor the field parameters (temperature, pH, turbidity, ORP, specific conductance, and DO) approximately every 3 to 5 minutes. A flow-through cell or similar will be used to monitor the field parameters. Begin measuring field parameters after the flow-through cell has been "flushed" with purged groundwater twice.
10. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings, as follows:
    - ±0.1 for pH
    - ±3 percent for conductivity
    - ±10 percent for DO
    - ±10 percent for turbidity
    - ±10mV for ORP
11. The tubing/pump must not be removed from the well between purging and sampling.

12. If the recharge rate of the well is very low, do not purge the well dry. The water level in the well should stay above the level of the tubing/pump inlet to prevent air entrainment. If air bubbles are observed in the purge stream, lower the flow rate. If air bubbles are still observed, turn off the pump and allow the well to recover before sampling.
13. Once the fields parameters have stabilized, prepare to collect the samples directly from the end of the tubing. Volatiles and analyses that degrade by aeration must be collected first. The bottles should be preserved and filled according to the procedures specified in the QAPP. Gloves should be changed between purging and sampling so that clean gloves are worn to collect samples.
14. Fill all sample bottles by allowing the pump discharge to flow gently down the inside of the bottle with minimal turbulence. For VOCs, fill each pre-preserved container with sample to just overflowing so that no air bubbles are entrapped inside. Cap each bottle as it is filled. For PAHs, fill each 1-liter amber bottle to nearly the top and cap thereafter. For dissolved metals, field filter well effluent and fill one 500 mL HDPE bottle to nearly the top and cap thereafter.
15. Once container filling is completed, label each sample (if not pre-labeled) and record them on the COC form. Sample labels should be smudge-proof or covered with transparent tape. Place sample containers into a Ziploc bag and immediately put into an iced cooler for shipment to the analytical laboratory. Segregate larger bottles with bubble wrap. Ice in coolers must be double-bagged to prevent leakage. Coolers must be packed to the top with bagged ice to prevent warming and bottle breakage.
16. Disconnect the tubing from the pump. Dedicated tubing will be left inside the well for future sampling events.
17. After sampling is complete, measure the total depth of the well.
18. Close and lock the well.
19. Decontaminate sampling equipment as described below.

5.0 DECONTAMINATION PROCEDURE

During field sampling, all equipment surfaces placed in the well or in contact with groundwater samples will be cleaned before purging and sampling the next well. As needed, plastic sheeting will be placed around the well-head to keep the work area clean. The equipment will be cleaned using the method described in the Decontamination SOP.

6.0 REFERENCES

United States Environmental Protection Agency (EPA). 1996. Low Stress (low flow) Purging and Sampling Procedures for the Collection of Ground Water Samples from Monitoring Wells. Revision 2. July 30.

United States Environmental Protection Agency (EPA). 2002. Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers. Ground Water Forum Issue Paper (EPA 542-S-02-001). May.

B-5 STANDARD OPERATING PROCEDURE
MONITORING WELL DEVELOPMENT

1.0 OBJECTIVE

To establish accepted procedures for the restoration of monitoring wells following drilling activities to yield minimally disturbed water sampled and pump test results.

2.0 BACKGROUND

Following installation of a well, it is necessary to restore, to the extent possible, the natural hydraulic disturbed zone around the well. A variety of techniques are available for developing the well to ensure turbidity-free groundwater samples. The specific method of well development will be decided upon in the field based on the most current available information.

The primary requirement of an effective development technique is to provide reversals or surges in flow to prevent bridging by formation particles, a common problem when flow is always in one direction. Reversals or surges can be created using surge blocks, bailers, pumps, getting tools, or a combination of devices.

Use of air for development should be avoided when samples are to be collected for VOC analyses as air surging tends to strip volatiles from the water. In general, formation water should be used for development, although if low-yielding water-bearing formations are being developed it may be necessary to introduce water from an outside source. The introduced water must be tested for chemical properties to evaluate its potential impact on the in-situ water quality (EPA 1986).

3.0 PERSONNEL REQUIRED AND RESPONSIBILITIES

- **Field Coordinator:** The Field Coordinator is responsible for ensuring that field personnel have been trained in the use of this procedure for verification that monitoring well development activities are performed in compliance with this procedure.
- **Field Geologist:** The Field Geologist is responsible for compliance with this procedure including well development, containerization of extracted water, and documentation.

4.0 EQUIPMENT REQUIRED

- Surge block, bottom-filling bailer, air surging, or pumping device
- pH meter
- Conductivity/temperature probe
- Well development/purging data form
- Clipboard and indelible ink pens
- 55-gallon drums for containerization of extracted water, if required

5.0 PROCEDURE

Development Methods

The common methods for developing wells are described by Aller et al. (1989) and Driscoll (1986) and include:

- Overpumping
- Backwashing
- Surging
- Bailing
- Jetting
- Airlift pumping
- Air surging

Well development procedures that have the potential to alter groundwater quality should not be used. Therefore, methods that involve adding water or other fluids to the well or that use air to accomplish development are not recommended. Generally, unsuitable methods for monitoring well development include jetting, airlift pumping, and air surging. However, air development techniques may be used if they offer site-specific advantages over other methods, and extreme care is taken to prevent air from contacting the screened interval. Air development techniques must only be implemented by an experienced operator.

Recommended monitoring well development methods include pumping, overpumping, bailing, and backwashing, in combination with some form of surging. The most effective combination and timing of these methods must be determined through field testing, or from experience developing wells in similar hydrogeologic regimes.

Movement of groundwater into the well in one direction generally results in bridging of the particles, and a means of inducing flow reversal is necessary to break down the bridging and produce a stable filter. Aller et al (1989) state that one of the most effective and efficient methods to induce flow reversal is through careful use of a properly constructed surge block. For a more detailed description of proper usage of a surge block and other methods of achieving flow reversal, see Aller et al.

One example of a well development field protocol is described blow:

1. Record static water level and total well depth.
2. Set the pump and record pumping rate and turbidity. Pump until turbidity (as measured by a nephelometer) reaches desired level or stabilizes.
3. Discontinue pumping and surge the well.
4. Measure depth to the bottom of the well. If more than 10 percent of the screen is occluded by sediments, remove excess sediment by bailing.
5. Reset the pump, recording pumping rate and turbidity. Pump until turbidity reaches desired level or stabilizes. If the well has been properly designed, the amount of pumping required to achieve the desired turbidity level will be substantially less than required in the first pumping cycle.

6. Repeat surging and pumping until the well yields water of acceptable turbidity at the beginning of a pumping cycle. A good way to ensure that development is complete is to shut the pump off during the last anticipated pumping cycle, leaving the pump in place, and restart it sometime later. The turbidity of the discharge water should remain low.

The pumping rate used during development must be greater than the highest rate expected to be used during subsequent purging and sampling. In fact, recent field experience suggests that extremely low (i.e., 100 to 500 mL/min) purging and sampling pumping rates may significantly reduce the turbidity of groundwater samples (Puls et al 1990). The pump intake should be placed close to, or within, the well screen interval.

The development techniques listed above are most efficient in wells with screens having the greatest area open to the aquifer. Therefore, continuous slot, or wire wrapped screens are recommended for use in formations where adequate development is expected to be difficult. The additional cost of continuous slot screen is typically more than compensated for by significantly less cost in development time and subsequent well purging times.

Development Criteria

Development should continue until clear, artifact-free, formation water is produced. Water quality parameters such as specific conductance, pH, temperature, and turbidity should be measured during development and should stabilize before development is stopped. Turbidity measurements are the most critical development criteria. Other parameters should be used to provide supplemental information regarding aquifer conditions, and stabilization of these parameters is indicative of the presence of formation water. If water was added during well construction or development, two to three times the volume of water added must be removed. Finally, the well should be producing visually clear water before development is stopped.

Experience has shown that development may take from less than an hour to several days, depending on the formation, development procedures, and well characteristics or construction. In some marginal aquifers such as glacial tills and interbedded sands and clays, it may be possible to attain the 5 nephelometric turbidity units (NTUs) turbidity target level used as guidance in RCRA. However, poor well construction practices, failure to emplace an adequate filter pack, or poor selection of screen slot size and sand pack materials, as well as inadequate development may result in high turbidity levels. In these situations, the PRP or contractor must demonstrate that the well has been constructed properly and all reasonable efforts have been expended to develop the well. The determination of whether to abandon the well or address the turbidity problem during sampling and analysis should be made by the project hydrogeologist in consultation with the EPA hydrogeologist.

After development is completed, wells should be allowed to stabilize and re-equilibrate before sampling. The time necessary for stabilization depends on the characteristics of the aquifer and the geochemistry of the parameters to be modified. Generally high permeability formations require less time (i.e., several days) than low permeability formations (i.e., several weeks).

Development Documentation

Monitoring well development must be thoroughly documented to verify that foreign materials have been removed, formation water is being sampled, and turbidity has reached acceptable levels or stabilized.

The following data should be recorded before and during well development:

1. Date and duration of development.
2. Water level from the marked measuring point on the top of casing before and 24 hours after well development.
3. Depth from top of well casing to the top of any sediment present in the well, before, during, and after sampling.
4. Types and quantity of drilling fluids introduced during drilling and development.
5. Field measurements (e.g., turbidity, specific conductance, pH, DO, temperature) taken before, during, and after well development.
6. Volume and physical characteristics of developed water (e.g., odor, color, clarity, and particulate matter).
7. Type and capacity of pump and/or bailer used and pumping rates.
8. Detailed description of all development methods used.

6.0 REFERENCES

Aller, L., T.W. Bennet, G. Hackett, R.J. Petty, J.H. Lehr, H. Sedoris, D.M. Nielsen, and J.E. Denne. 1989. Handbook of Suggested Practices for the Design and Installation of Ground-water Monitoring Wells: Technology Support Center, Environmental Monitoring Systems Laboratory, EPA600/4-89/034, United States Environmental Protection Agency.

Driscoll, Fletcher F. 1986. Groundwater and Wells, 2nd Edition, Johnson Division, St. Paul, Minnesota.

Puls, R.W., J.H. Eychaner, and R.M. Powell. 1990. Colloidal-Facilitated Transport of Inorganic Contaminants in Ground Water: Part I, Sampling Considerations, Environmental Research Brief, USEPA, EPA/600/M-90/023.

U.S. EPA. 1986. OWER_9950-1, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD), Office of Solid Waste and Emergency Response.

B-6 STANDARD OPERATING PROCEDURE STATIC WATER LEVEL MEASUREMENT

1.0 OBJECTIVE

The objective of this SOP is to describe a method for collecting a static water level measurement. Measurements will be made from groundwater monitoring wells accurate to the nearest 0.01 foot from a standard reference point on the well casing.

2.0 MATERIALS

The following materials are required for the collection of static water level measurements:

- Well keys
- Electronic water-level indicator
- Weighted steel tape
- Paper towels
- De-ionized water
- Health and safety equipment

3.0 PROCEDURE

The following steps will be taken during the collection of static water level measurements:

1. Unlock and open well. Verify well integrity.
2. Lower electronic water level indicator to the water surface.
3. When the sounder indicates that the indicator probe has contacted water, raise and lower the probe to verify exact point at which measurement should be taken.
4. Measure the depth to water, to the nearest 0.01 foot, from the reference point (notch or mark on well casing).
5. Record the measurement, to the nearest 0.01 foot, in the field notebook or on the Groundwater Sampling Data Sheet.
6. Measure total well depth to the nearest 0.1 foot using weighted steel tape.
7. Replace well cap and close and lock protective well casing.

4.0 DECONTAMINATION

Equipment will be cleaned using the method described in the Decontamination SOP.

A-11 STANDARD OPERATING PROCEDURE
FIELD HYDROCARBON LOGGING METHODS AND SHEEN TEST

1.0 PURPOSE AND APPLICABILITY

This SOP describes a procedure to visually estimate areas of possible hydrocarbon impacts in soil or sediment. In addition, screening results can be used to aid in the selection of soil/sediment samples for chemical analysis. The field screening method includes:

- Visual examination
- Water sheen screening

Visual screening consists of inspecting the soil/sediment for stains, NAPL, and/or sheens indicative of residual hydrocarbons. Visual screening is most effective at detecting heavy hydrocarbons, such as creosote, or high hydrocarbon concentrations. Water sheen screening from a representative soil sample is a more sensitive method at detecting the presence of hydrocarbons.

Specific project requirements as described in an approved Work Plan, SAP, QAPP, or site-specific HASP will take precedence over the procedures described in this document.

Health and Safety

This section presents the potential hazards associated with this technique. The site-specific HASP may address additional requirements and will take precedence over this document. Note that sample collection usually requires Level D personal protection unless there is a potential for airborne or dermal exposures to Site contaminants.

Health and safety hazards include but are not limited to the following:

- Dermal exposure to potentially contaminated media: Ensure that proper PPE will be used to mitigate dermal contact including the impact of splashes of water or media to skin and/or eyes
- Dermal exposure to broken glass. Use care if handling glassware
- Inhalation exposure when handling impacted media. Respiratory protection should follow the procedures outlined in the site-specific HASP

2.0 MATERIALS

The following materials must be on hand in sufficient quantity to ensure that proper screening procedures may be followed.

- Approximately 1 cubic-inch of media to be screened
- A 2 or 4 oz. wide-mouth glass jar (some field situations may require the use of a plastic baggie)
- Stirring devise (i.e., spoon)
- Squirt bottle
- Supply of distilled water

3.0 METHODS AND PROCEDURE

The strategy used to collect soil/sediment samples in the field for sheen testing will depend on the nature/grain size of the material and the type of hydrocarbon. Discrete samples may be collected from specific depths where NAPL is likely to occur. When lithology is coarse-grained material over fine-grained material, then a sample should be collected just above this interface where NAPL may be pooling above the fine-grained material. Similarly, where fine-grained material overlies a coarse-grained layer with suspected impacts, the sample should be collected just below the contact.

Alternatively, when lithology is finely bedded (less than 1-inch thick), then homogenized samples may be collected over a larger depth interval to gain an "average" observation. Use a spoon to scrape material across the surface of the depth interval of interest, and place into sample jars for further observation. Once the sample is collected (approximately 2 to 4 ounces depending upon grain size) the sample is examined and tested as described below.

Visual Examination

In the field, observe sediment core tubes or soil samples for evidence of NAPL. If NAPL is observed, make a qualitative evaluation of its viscosity, and note its occurrence in the context of the soil lithology. For example, note if NAPL is present as a continuous pool above a low permeability layer, or if it occurs in discontinuous stringers within a coarser-grained layer. Observe the sidewalls of the sampling container for signs of staining. If wet, observe the nature of liquid. Among gravels, observe the surface of the gravel for signs of sheen and/or NAPL.

Qualitative nomenclature for oil on soil samples is described below:

- *No visible evidence* – No visible evidence of oil on soil sample.
- *Sheen* – Sheen as described by the sheen testing nomenclature presented below
- *Staining* – Visible brown or black staining on soil/sediment. Can be visible as mottling or in bands. Typically associated with fine-grained soils.
- *Coating* – Visible brown or black oil coating soil/sediment grains. Typically associated with coarse-grained soils.
- *Oil Wetted* – Visible brown or black oil wetting the soil/sediment sample. Oil appears as a liquid and is not held by soil grains. Soils oozing petroleum typically contain approximately 2 to 3 percent petroleum.

Naturally occurring sheen is often found in the field. Naturally occurring sheen can be similar in color to hydrocarbon sheens and can range in color from a milky white to a metallic blue. It can be discerned from hydrocarbon sheen due to its ability to break up when disturbed by touch.

Water Sheen Test

Water sheen screening involves placing soil/sediment in a clear glass jar or a black plastic pan partially filled with water, and observing the water surface for signs of sheen. The volume of soil/sediment required for observation is approximately 1 cubic inch, or 10 mls, or about 1 tablespoon of media. For practical application in the field or lab, place about 1 cubic inch of soil/sediment in a 2 or 4 oz jar filled ¼-full with water. For larger volumes, use about 2 oz of material in an 8 oz wide-mouth glass jar filled one quarter full with water. Even larger volumes are needed for gravel. A plastic baggie may be substitute for a glass jar if field conditions require. Observe the water surface and sidewalls of the jar for signs of sheen, LNAPL, and DNAPL. Naturally occurring sheen can be discerned from hydrocarbon sheen by its ability to dissolve or break-up upon agitation; do so gently with a spoon and record observations.

Sheen test nomenclature is described below:

- *No Sheen (NS)* – No visible sheen on water surface
- *Slight Sheen (SS)* – Light colorless film; spotty to globular; spread is irregular, not rapid; areas of no sheen remain; film dissipates rapidly
- *Moderate Sheen (MS)* – Light to heavy film, may have some color or iridescence, globular to stringy, spread is irregular to flowing; few remaining areas of no sheen on water surface
- *Heavy Sheen (HS)* – Heavy colorful film with iridescence; stringy, spread is rapid; sheen flows off the sample; most of water surface may be covered with sheen

Quantify the spatial coverage of sheen, size/diameter of NAPL blebs if observed, and color. Visual descriptions and percent coverage are provided in the table below.

Sheen Test- % coverage	
No sheen	<2
Slight Sheen	2-15
Moderate Sheen	15-40
Moderate to Heavy	40-70
heavy	>70

Sheen Test- Visual Description	
rainbow	multicolored
metallic	metallic gray-colored
florets	semi-circular and multicolored
blebs	semi-circular and black/brown
streaks	long and flowing shape

Field screening results will be recorded on the field logs forms or in a field notebook. Field screening results are site-specific and location-specific. Factors that may affect the performance of this method include: operator experience (experimentation may be required before routine screening is started) ambient air temperature, soil type, soil moisture, organic content, and type of hydrocarbon.

B-8 STANDARD OPERATING PROCEDURE

DIRECT-PUSH SAMPLE COLLECTION AND PROCESSING METHODS

1.0 OBJECTIVE

The objective of this SOP is to describe the protocols for conducting direct push sampling and processing.

2.0 MATERIALS

The following materials will be needed:

- Direct-push drill rig and sampling equipment
- Disposable acrylic core liners
- Project QAPP
- Soil Boring Log Sheets and indelible ink pens
- If sampling has previously been completed for similar location(s), copies of the most recently completed Soil Boring Log Sheets
- Sample containers and labels as described in the project QAPP
- Insulated cooler(s) with ice
- Paper towels
- Duct tape
- Tape measurer
- Plastic Ziploc bags
- Appropriate PPE and clothing as defined in the Site HASP
- Decontamination materials
- Groundwater Sampling Equipment (if groundwater samples are to be collected: see SOP A-4)

3.0 SAMPLING PROCEDURE

Subsurface soil samples will be collected by direct-push drill rig. A direct-push drill rig collects a continuous profile of subsurface soil by utilizing a hydraulic hammering device that penetrates into the subsurface. Soil samples can be collected with a variety of sampling devices including 4-foot core tubes with acrylic liners or split-spoon piston samplers.

Prior to deployment, the following procedure will be used to decontaminate non-disposable sampling equipment and drill rods:

- Rinse and pre-clean with potable water
- Wash and scrub the sampler and rods in a solution of laboratory grade, non-phosphate-based soap and potable water
- Rinse with potable water
- Rinse with distilled water

Soil samples will be collected in the following manner:

- Drill rig will mobilize to the proposed sample location
- Soil samples will be collected at a continuous basis to the target depth using 4-foot long core tubes with 1.5-inch diameter disposable core liners
- The core liner will be opened using a utility knife

A licensed geologist from Aspect Consulting will prepare a geologic log for each of the explorations completed.

The Aspect field geologist will also visually classify the soils in accordance with ASTM Method D 2488 and record soil descriptions, field screening results, and other relevant details (e.g., staining, debris, odors, etc.) on the boring or boring log. Sheen and DNAPL presence will be assessed in accordance with SOP A-11. Color photographs will be taken of each soil core.

If DNAPL is identified, a soil sample will be collected for chemical analysis from the interval containing DNAPL. Only soil from the DNAPL-saturated interval will be placed in the sampling containers. The soil sample will not be combined with any intervals not containing DNAPL. Soil will be placed in a glass jar with a stainless steel spoon. Gravel-sized material greater than approximately 0.5 inch will be removed from the sample. Soil will be placed into certified-clean jars supplied by the analytical laboratory.
Each soil boring will be decommissioned with bentonite grout, and the location staked for later survey. Decontamination of all down-hole tools will be completed between each exploration. Decontamination and management of investigation-derived waste in other SOPs.

Groundwater samples, if called for in the SAP, will be collected in the following manner:

- A clean, 3-foot long, stainless steel screen shall be placed at the targeted depth interval.
- The outer drill rod casing will be pulled back to expose the screen to the soil matrix.
- Low-flow groundwater sampling will be conducted in accordance with SOP A-5, except as follows:
  - The temporary well screen will be developed by pumping groundwater until turbidity is reduced as much as practicable (i.e., further pumping does not visibly improve water quality).
  - After turbidity stabilizes, field parameters will be recorded, and the groundwater sample will be collected.

Aspect personnel will record field conditions and drive notes on a standard core log. Logs will include the following information:

- Location of each station as determined by DGPS
- Date and time of collection of each soil DNAPL sample
- Names of field personnel collecting and handling the samples

- Observations made during sample collection, including weather conditions, complications, and other details associated with the sampling effort
- The sample station identification
- Length and depth intervals of each sample section and estimated recovery for each sample section as measured from ground surface.
- Qualitative notation of apparent resistance of soil to penetration
- Any deviation from the approved QAPP

B-9 STANDARD OPERATING PROCEDURE
NAPL THICKNESS MEASUREMENT

1.0 OBJECTIVE

The objective of this SOP is to describe a method for measuring the thickness of NAPL in monitoring wells. Measurements will be made in groundwater monitoring wells accurate to the nearest 0.01 foot from a standard reference point on the well casing.

2.0 MATERIALS

The following materials are required for the collection of NAPL thickness measurements:

- Well keys
- Product –water interface meter
- Paper towels
- De-ionized water
- Methanol
- Health and safety equipment

3.0 PROCEDURE

The following steps will be taken during the collection of DNAPL thickness measurements:

1. Unlock and open well. Verify well integrity.
2. Lower product-water interface meter to the fluid surface.
3. When the sounder indicates that the indicator probe has contacted water, raise and lower the probe to verify exact point at which measurement should be taken.
4. Measure the depth to water, to the nearest 0.01 foot, from the reference point (notch or mark on well casing).
5. Record the measurement, to the nearest 0.01 foot, in the field notebook or on the Groundwater Sampling Data Sheet.
6. The product-water interface meter will sound differently for NAPL and for water (consult manufacturer's literature). If NAPL is identified above the water table, raise and lower the probe around the top of the NAPL to verify the exact point at which measurement should be taken.
7. If product is identified below the water table, raise and lower the probe around to the top of the NAPL to verify the exact point at which measurement should be taken.
8. Measure the depth to NAPL, to the nearest 0.1 foot, from the reference point.
9. Record the measurement, to the nearest 0.01 foot, in the field notebook or on the Groundwater Sampling Data Sheet.
10. Measure total well depth to the nearest 0.1 foot using weighted steel tape.
11. Replace well cap and close and lock protective well casing.

4.0 DECONTAMINATION

Equipment will be cleaned using the method described in the Decontamination SOP.

APPENDIX B

Marine SQAPP

Marine Sampling and Quality Assurance Project Plan

Appendix B of the Draft RI/FS Work Plan

Bremerton Gas Works Site

Prepared for: Cascade Natural Gas Corporation

Aspect Project No. 080239-005 •Anchor QEA Project No. 131014-01.01
April 17, 2015

Prepared by

Aspect Consulting, LLC
401 Second Avenue South, Suite 201
Seattle, Washington 98104

Anchor QEA, LLC
720 Olive Way, Suite 1900
Seattle, Washington 98101

Marine Sampling and Quality Assurance Project Plan

Appendix B of the Draft RI/FS Work Plan

Bremerton Gas Works Site

Prepared for: Cascade Natural Gas Corporation

Aspect Project No. 080239-005 •Anchor QEA Project No. 131014-01.01
April 17, 2015

Aspect Consulting, LLC & Anchor QEA, LLC

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Marine Sampling and Quality Assurance Project Plan

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Acronyms

°C	degrees Celsius
ADCP	acoustic doppler current profiler
Anchor QEA	Anchor QEA, LLC
AOC	Administrative Order on Consent
ARI	Analytical Resources, Inc.
Aspect	Aspect Consulting, LLC
ASTM	American Society of Testing Materials
Cascade	Cascade Natural Gas Corporation
CCV	continuing calibration verification
COC	chain of custody
COPC	contaminant of potential concern
DGPS	digital global positioning system
DQO	data quality objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FC	Field Coordinator
GC	gas chromatography
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	investigation-derived waste
ISA	initial study area
MD	matrix duplicate
MDL	method detection limit
MGP	manufactured gas plant
MLLW	mean lower low water
MS	matrix spike
MSD	matrix spike duplicate
NAD	North American Datum
NAPL	nonaqueous phase liquid

NIST	National Institute of Standards and Technology
OSHA	Occupational Safety and Health Act
PAH	polycyclic aromatic hydrocarbon
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RI/FS	Remedial Investigation/Feasibility Study
RL	reporting limit
RPD	relative percent difference
SDG	sample delivery group
Site	Bremerton Gas Works Site
SOP	Standard Operating Procedure
SPME	solid-phase microextraction
SQAPP	Sampling and Quality Assurance Project Plan
TOC	total organic carbon
TS	total solids

1 Introduction

Cascade Natural Gas Corporation (Cascade) is conducting a Remedial Investigation (RI) and Feasibility Study (FS) at the Bremerton Gas Works Site (Site) in Bremerton, Washington under the direction of the U.S. Environmental Protection Agency (EPA). The work is being conducted in accordance with the Administrative Settlement Agreement and Order on Consent for Remedial Investigation Feasibility Study (AOC; Comprehensive Environmental Response, Compensation, and Liability Act Docket No 10-2013-0104). Consistent with the AOC, the Site includes the area where the gas works was formerly located (Figure B-1), and areas that may have been affected by contamination originating from the former Gas Works. This document describes the sampling and quality assurance project plan (SQAPP) for the marine environment and is Appendix B to the EPA-approved RI/FS Work Plan. Appendix A of the RI/FS Work Plan is the Upland SQAPP.

This SQAPP describes data quality objectives, sampling and analytical methods, quality assurance/quality control (QA/QC) procedures, and management of data to support the RI/FS. The SQAPPs provide supplemental information to the RI/FS Work Plan, and the documents should be used concurrently to achieve project goals.

1.1 Project Overview

This section presents a general overview of the marine Site characteristics used to inform the development of this SQAPP. More detailed information regarding environmental setting, resource, historical investigation data, and Time Critical Removal Actions is provided in the EPA-approved Scoping Memorandum and RI/FS Work Plan. The upland project overview is provided under a separate cover.

The Site encompasses upland and marine areas near the operation of a former manufactured gas plant (MGP) and adjacent areas where legacy contaminants have been located. The Site is adjacent to the Port Washington Narrows, which is a tidal channel connecting Dyes Inlet to Sinclair Inlet and the Puget Sound. The waters of Port Washington Narrows are relatively shallow, with average depths of less than 30 feet. Dyes Inlet is a terminal estuary, composed of five embayments (Phinney, Mud, Ostrich, Oyster, and Chico Bays) and the Port Washington Narrows. Depths within Dyes Inlet range up to 100 feet, but are typically less than 50 feet. Hydrologic inputs to the Port Washington Narrows and Dyes Inlet include the tidal exchange with Sinclair Inlet and freshwater inflows from both stream and piped flows.

Aquatic habitats at the Site include those in the beach and subtidal areas within and near the former Gas Works property. Shoreline and aquatic habitat adjacent to the former Gas Works property are located within the Tribal Usual and Accustomed area. There are no recorded archaeological sites or historic structures at the former Gas Works property or in the immediate vicinity. However, no cultural resources surveys have been conducted on the Site or in the vicinity prior to the present project.

1.2 Proposed Study Area Boundaries

As defined in the EPA-approved Scoping Memorandum (Anchor QEA and Aspect 2015), the study area is composed of two areas: the initial study area (ISA) and the area beyond the ISA in Port Washington Narrows. The purpose of the ISA does not define the final marine Site boundary.

The marine ISA boundary and Port Washington Narrows study areas are shown in Figures B-2 and B-3, respectively. The ISA is composed of intertidal and subtidal marine environment immediately adjacent to the former MGP and includes the following areas:

- Historical potential source areas associated with the MGP (including the former Gas Works Dock and the former drainage line) have been included.
- Beach sediments adjacent to the MGP that exhibited elevated polycyclic aromatic hydrocarbon (PAH) concentrations during the 2013 Time Critical Removal Action have been included.
- The offshore boundary of the ISA extends out past mid-channel in the Port Washington Narrows. This addresses potential migration pathways associated with groundwater and/or nonaqueous phase liquid (NAPL) migration and those associated with potential sediment transport.
- The eastern and western boundaries of the ISA extend between 500 and 1,000 feet in an east/west direction from the MGP, providing the ability to document potential transport of sediments that may have resulted from the east-west tidal currents occurring within the Port Washington Narrows.

The ISA includes multiple potential sources that are not associated with the historical activities at the MGP. These include multiple historical petroleum transfer docks, multiple stormwater and combined sewer overflow outfalls, and the Port Washington Marina.

As part of the RI/FS activities for sediments, there is a need to understand regional trends in sediment and water quality that may affect either current Site conditions or result in future recontamination of the Site. Therefore, additional sampling activities for sediments and surface water will be conducted within Port Washington Narrows.

1.3 Document Organization

This SQAPP was prepared in accordance with EPAs guidance for developing QAPPs (Quality Assurance Project Plans; EPA 2004). EPA's guidance specifies four groups of information that must be included in a QAPP (Project Management, Data Generation and Acquisition, Assessment and Oversight, and Data Validation and Usability). Each group comprises multiple QAPP elements.

The remainder of this SQAPP is organized into the following sections:

- Section 2—Project Management
- Section 3—Data Generation and Acquisition

- Section 4—Assessments and Response Actions
- Section 5—Data Validation and Usability
- Section 6—References

2 Project Management

This section identifies key project personnel, describes the rationale for conducting the investigation studies, identifies the studies to be performed, outlines project DQOs and criteria, lists training and certification requirements for sampling personnel, and describes documentation and recordkeeping procedures. The project schedule is provided in the RI/FS Work Plan.

2.1 Project/Task Organization

Responsibilities of the team members, as well as laboratory project managers, are described in the following paragraphs.

Anchor QEA, LLC (Anchor QEA) has the primary role of Project Manager for the marine components of the RI/FS Work Plan, while Aspect Consulting, LLC (Aspect) has the primary role of Project Manager for the upland components of the RI/FS Work Plan. This document addresses only the marine components; the upland components will be addressed under separate cover in a SQAPP prepared by Aspect.

Anchor QEA Project Manager (PM): Mark Larsen, will act as the direct line of communication between contractors, Aspect, and Cascade and is responsible for implementing activities described in this SQAPP. He will also be responsible for production of work plans, producing all project deliverables, and performing the administrative tasks needed to ensure timely and successful completion of these studies. The Project Manager will provide the overall programmatic guidance to support staff and will ensure that all documents, procedures, and project activities meet the objectives contained within this SQAPP. The Project Manager will also be responsible for resolving project concerns or conflicts related to technical matters. The Project Manager will notify Cascade of any long-term changes in core personnel.

Field Coordinator (FC): Nathan Soccorsy, is responsible for day-to-day technical and QA/QC oversight. He will ensure that appropriate protocols for sample collection, preservation, and holding times are observed and will submit environmental samples to the designated laboratories for chemical and physical analyses.

Quality Assurance/Quality Control: Delaney Peterson, will provide QA oversight for both the field sampling and laboratory programs, ensure that samples are collected and documented appropriately, coordinate with the analytical laboratories, ensure data quality, oversee data validation, and supervise project QA coordination and data validation.

Data Manager: Delaney Peterson, will compile field observations and analytical data into a database, review the data for completeness and consistency, append the database with qualifiers assigned by the data validator, and ensure that the data obtained are in a format suitable for inclusion in the appropriate databases and delivery to EPA.

Laboratory Project Manager: Cindy Fields, will oversee all laboratory operations associated with the receipt of the environmental samples, chemical/physical analyses, and laboratory report preparation for this project. The Laboratory Project Manager will review all laboratory reports and prepare case narratives describing any anomalies and exceptions that occurred during analyses.

The analytical testing laboratory will be responsible for the following:

- Performing the methods outlined in this SQAPP, including those methods referenced for each analytical procedure
- Following documentation, custody, and sample logbook procedures
- Implementing QA/QC procedures required by EPA (1999, 2004, 2005), or other guidelines
- Meeting all reporting and QA/QC requirements
- Delivering electronic data files as specified in this SQAPP
- Meeting turnaround times for deliverables as described in this SQAPP

Laboratory Data Consultants is anticipated to serve as the primary contact to perform all applicable data validation.

2.2 Problem Definition/Background

This SQAPP defines the marine investigation elements required to complete an RI/FS Report. Data gaps were identified in the Scoping Memorandum and RI/FS Work Plan, which require the collection of supplemental data. This SQAPP details the collection of these data including testing of surface sediment and corresponding porewater, subsurface sediment, and surface water; an evaluation of shellfish resources to provide abundance data on consumable resources; an evaluation of the benthic floor (substrate, vegetation, and aquatic life); and an evaluation of tidal currents to evaluate sediment stability. Procedures for conducting the risk assessments and other tasks associated with the RI/FS are included in the RI/FS Work Plan.

2.3 Project/Task Description and Schedule

Sampling activities described in this SQAPP will be initiated following EPAs approval and as outlined in the schedule in the RI/FS Work Plan.

2.4 Data Quality Objectives and Criteria

The data quality objectives (DQOs) for this project will ensure that the data collected are of known and acceptable quality so that the project objectives described in the RI/FS Work Plan and this SQAPP are achieved. The quality of the laboratory data is assessed by precision, accuracy, representativeness, comparability, and completeness (the “PARCC” parameters). Definitions of these parameters and the applicable quality control procedures are given below. Applicable quantitative goals for these data quality parameters are listed or referenced in Table B-1.

2.4.1 Precision

Precision is the ability of an analytical method or instrument to reproduce its own measurement. It is a measure of the variability, or random error, in sampling, sample handling, and laboratory analyses. The American Society of Testing and Materials (ASTM) recognizes two levels of precision (ASTM 2002):

1) Repeatability—the random error associated with measurements made by a single test operator on identical aliquots of test material in a given laboratory with the same apparatus under constant operating conditions.

2) Reproducibility—the random error associated with measurements made by different test operators in different laboratories using the same method but different equipment to analyze identical samples of test material.

In the laboratory, "within-batch" precision is measured using duplicate sample or quality control analyses and is expressed as the relative percent difference (RPD) between the measurements. The "batch-to-batch" precision is determined from the variance observed in the analyses of standard solutions or laboratory control samples from multiple analytical batches.

Field precision will be evaluated by the collection of field duplicates for chemistry samples at a frequency of one in 20 samples. Field chemistry duplicate precision will be screened against an RPD of 50%. However, no data will be qualified based solely on field homogenization duplicate precision.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit (MDL), where the percent error (expressed as RPD) increases. The equation used to express precision is as follows:

$$\mathrm{RPD} = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2)/2}$$

Where:

RPD = relative percent difference

C1 = larger of the two observed values

C2 = smaller of the two observed values

2.4.2 Accuracy

Accuracy is a measure of the closeness of an individual measurement (or an average of multiple measurements) to the true or expected value. Accuracy is determined by calculating the value of results from analyses of laboratory control samples, standard reference materials, and standard solutions. In addition, matrix-spiked samples are also measured, which indicate the accuracy or bias in the actual sample matrix. Accuracy is expressed as percent recovery of the measured value, relative to the true or expected value. If a measurement process produces results that are not the true or expected values, the process is said to be biased. Bias is the systematic error either inherent in a method of analysis (e.g., extraction efficiencies) or caused by an artifact of the measurement system (e.g., contamination). Analytical laboratories utilize several quality control measures to eliminate analytical bias, including systematic analysis of method blanks, laboratory control samples, and independent calibration verification standards. Because bias can be positive or negative, and because several types of bias can occur simultaneously, only the net, or total, bias can be evaluated in a measurement.

Laboratory accuracy will be evaluated using quantitative laboratory control sample, matrix spike (MS), surrogate spike, and calibration standard recoveries compared with method-specified performance criteria or criteria listed in Table B-1. Accuracy can be expressed as a concentration compared to the true or reference value, or as a percent recovery in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follows:

$$\%R = 100\% \times (S-U)/Csa$$

Where:

$\%R$ = percent recovery

S = measured concentration in the spiked aliquot

U = measured concentration in the unspiked aliquot

Csa = actual concentration of spike added

Field accuracy will be controlled by adherence to sample collection procedures outlined in this SQAPP.

2.4.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. For the Cascade Property, the list of analytes has been identified to provide a comprehensive assessment of the known and potential contaminants at the site.

2.4.4 Comparability

Comparability expresses the confidence with which one data set can be evaluated in relation to another data set. For this program, comparability of data will be established through the use of standard analytical methodologies and reporting formats and through common traceable calibration standards and reference materials.

2.4.5 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

$$C = \frac{(\text{Number of acceptable data points}) \times 100}{(\text{Total number of data points})}$$

The DQO for completeness for all components of this project is 95%. Data that have been qualified as estimated because the quality control criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been rejected will not be considered valid for the purpose of assessing completeness.

2.4.6 Sensitivity

Sensitivity is a measure of analytical detection and reporting limits. In general, the lowest technologically achievable reporting limits will be targeted for this project. Analytical sensitivities must be consistent with or lower than the reporting limits listed in Tables B-5 through B-8 for non-detected results. If the target non-detected reporting limits cannot be met, the QA will be notified by the laboratory prior to proceeding with the analyses to discuss possible additional extract cleanups and/or method modifications to improve analytical sensitivities. The RI/FS Work Plan provides preliminary screening values, and future cleanup criteria will be coordinated with ongoing efforts of the Bremerton Gas Works project.

The MDL is defined as the minimum concentration at which a given target analyte can be measured and reported with 99% confidence that the analyte concentration is greater than zero. Laboratory practical quantitation limits or reporting limits (RLs) are defined as the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. Laboratory MDLs and RLs will be used to evaluate the method sensitivity and/or applicability prior to the acceptance of a method for this program.

The sample-specific MDL and RL will be reported by the laboratory and will take into account any factors relating to the sample analysis that might decrease or increase the reporting limit (e.g., dilution factor, percent moisture, and sample mass/volume). In the event that the MDL and RL are elevated for a sample due to matrix interferences and subsequent dilution or reduction in the sample aliquot, the data will be evaluated by Anchor QEA and the laboratory to determine if an alternative course of action is required or possible. If this situation cannot be resolved readily (i.e., detection limits less than criteria are achieved), EPA will be contacted to discuss an acceptable resolution. The sample-specific RL will be the value provided in the project database.

2.5 Special Training Requirements/Certifications

For sample preparation tasks, it is important that field crews are trained in standardized data collection requirements so that the data collected are consistent among the field crews. Field crews will be comprised of individuals who are fully trained in the collection and processing of surface sediment grabs, subsurface coring, surface water collection, shellfish evaluations, video surveying, tidal current evaluations, decontamination protocols, and chain-of-custody (COC) procedures.

In addition, the 29 CFR 1910.120 Occupational Safety and Health Act (OSHA) regulations require training to provide employees with the knowledge and skills enabling them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet the OSHA regulations.

2.6 Documentation and Records

This project will require central project files to be maintained at Anchor QEA. Project records will be stored and maintained in a secure manner. Each project team member is responsible for filing all necessary project information or providing it to the person responsible for the filing system. Individual team members may maintain files for individual tasks, but must provide such files to the central project files upon completion of each task. Hard copy documents will be kept on file at Anchor QEA or at a document storage facility throughout the duration of the project, and all electronic data will be maintained in the database at Anchor QEA.

2.6.1 Field Records

All documents generated during the field effort are controlled documents that become part of the project file. Field team members will keep a daily record of significant events, observations, and measurements on field forms specific to the collection activity. Field forms will be maintained by the FC. The sampling documentation will contain information on each sample collected and will include, at a minimum, the following information:

- Project name
- Field personnel on site
- Facility visitors
- Weather conditions
- Field observations
- Date and time sample collected
- Sampling method and description of activities

- Identification or serial numbers of instruments or equipment used
- Deviations from this SQAPP
- Meetings associated with field sampling activities

Entries for each day will begin on a new form. The person recording information must enter the date and time. In general, sufficient information will be recorded during sampling so that reconstruction of the event can occur without relying on the memory of the field personnel.

The field forms may be electronic or hand-written. If hand-written they will be on water-resistant, durable paper. Notes will be made in indelible, waterproof blue or black ink. Errors will be corrected by crossing out with a single line, dating, and initialing. Each form will be marked with the project name, number, and date. The field forms will be scanned or saved into Anchor QEA's project file directory as convenient during the sampling event or upon completion of each sampling event.

2.6.2 Analytical Records

The laboratory will retain analytical data records. Additionally, Anchor QEA will retain a copy of analytical data in its central project files. Data reporting requirements will include those items necessary to complete data validation, including copies of raw data. Elements to be reported in the laboratory data packages are listed in Section 3.5.2.6.

Instrument data shall be fully restorable at the laboratory from electronic backup. The laboratory will be required to maintain records relevant to project analyses for a minimum of 5 years. Data validation reports will be maintained in the central project files with the analytical data reports.

2.6.3 Data Reduction

Data reduction is the process by which original data (analytical measurements) are converted or reduced to a specified format or unit to facilitate analysis of the data. Data reduction requires that all aspects of sample preparation that could affect the test result, such as sample volume analyzed or dilutions required, be taken into account in the final result. It is the laboratory analyst's responsibility to reduce the data, which are subject to further review by the Laboratory Manager, the Project Manager, the QA/QC Manager, and independent reviewers. Data reduction may be performed manually or electronically. If performed electronically, software used must be free from error.

3 Data Generation and Acquisition

Rationale for the sampling design and design assumptions for locating and selecting environmental samples, as well as methods and procedures for the collection of field samples, are provided in this section. Sampling will be conducted following standard procedures documented in this SQAPP. In general, all sampling procedures will comply with approved sample collection standards established for the study area.

3.1 Sampling Design—Marine Investigation

Marine data gaps identified in the scoping process are the basis of the marine investigation design. The elements of the marine investigation designed to fill the identified data gaps are summarized in Table 6-6 and include the following:

- **Video Surveys.** Video surveys will be conducted to identify substrate, habitat characteristics, and presence/abundance of aquatic resources near the Site.
- **Surface Sediment Investigation**. Surface sediments will be sampled and analyzed as follows:
    - Within the ISA to define the nature and extent of site-related COPCs. A subset of samples will be analyzed to evaluate an expanded list of analytes and verify the analyte list to be used for other sediment investigations.
    - Beyond the ISA to assess the quality of sediment within the Port Washington Narrows that could potentially contribute to recontamination of the Site following implementation of the cleanup action.
    - Analyze paired samples of bulk sediment and pore-water from within the ISA and within Port Washington Narrows to determine how actual PAH leaching compares with leaching estimated using literature-derived partitioning coefficients.
- **Subsurface Sediment Investigation.** Subsurface sediment core samples will be collected from the beach and subtidal areas sloping down into the Port Washington Narrows to evaluate the vertical distribution of Site-related COPCs (including the potential presence of NAPL and hydrocarbon sheen) in subsurface sediments.
- **Beach Shellfish Surveys.** Beach surveys will be performed to evaluate the distribution of existing shellfish resources within and near the beach areas adjacent to the Former Gas Works Property and within comparable beach areas within Port Washington Narrows.
- **Surface Water Investigation.** Surface water samples from selected Site and background locations will be collected and analyzed during multiple sampling events to assess potential variability in the concentrations of contaminants in surface water.
- **Tidal Current Evaluation.** Near-bottom tidal currents within the aquatic areas of the Site will be monitored to assist in the evaluation of sediment stability.

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Some elements of the marine investigation will be conducted sequentially in order to adaptively manage the scope of work. For example, subtidal surface sediment sampling will be conducted to determine the lateral extent of contamination. The preliminary results of the subtidal surface sediment investigation will be evaluated to determine if modifications to the subsurface scope of work are required prior to implementation. Other elements of the scope work, such as the surface water, tidal current, and beach shellfish survey, are not sequential. The sections below provide the general rationale and approach for these components of the marine investigation.

3.1.1 Video Survey Collection

Towed camera video surveys will be conducted to allow for a relative comparison of environmental conditions within and adjacent to the Site. The surveys objective is to identify substrate types, habitat characteristics, and presence/abundance of aquatic resources. The video surveys will be collected along 12 predefined transects in the Port Washington Narrows in the vicinity of the ISA (Figure B-2). Six transects each will be conducted perpendicular to and parallel with the shoreline of the Port Washington Narrows. The parallel video transects are positioned at the southern and northern shores at the -10 feet mean lower low water (MLLW) and -20 feet MLLW contours (Figure B-2), through the deeper channel area adjacent to the former gas works, and over the shallower area in the central channel. One of the perpendicular transects is positioned through the slope adjacent to the former gas works and two are positioned to the east and west in the Port Washington Narrows. After the video surveys are complete, the locations of the transects will be plotted on a figure. The videos will be reviewed to qualitatively determine the substrate type, habitat characteristics, presence/abundance of aquatic resources, and other significant observations, and the results will be logged. This survey will yield an interpretative figure, which will present the video survey findings.

3.1.2 Surface Sediment Investigation

Surface sediment samples will be collected to determine the horizontal nature and extent of Site-related contamination, chemical fate and transport, determination of COPCs, and relative bioavailability of Site-related contamination. All surface sediments will be collected from a depth 0 to 4 inches below the mudline that typically comprise the bioactive zone. Consistent with previous Site-related investigations, intertidal sediment locations will be collected by hand from during low tide. All subtidal surface sediment samples will be collected using a power actuated Van Veen grab sampler. The surface sediment samples will be tested for alkylated PAHs and physical properties such as total solids (TS), total organic carbon (TOC), and grain size.

The surface sediment immediately adjacent to the former Gas Works operation will be characterized by 17 sampling locations in transects down the slope toward Port Washington Narrows channel and two locations immediately to the west of the slope within the marina (Figure B-3 and Figure B-5). These 19 surface sediment locations are collocated with subsurface cores for vertical delineation (see 3.1.3). All intertidal surface sediment locations will be submitted for expanded analytical testing of COPC's including total and available cyanide, metals, and semi-volatile organic compounds. In addition, these five locations will be tested to determine the relative bioavailability of PAHs through ex situ porewater solid-phase microextraction (SPME) testing.

Additional surface sediment samples will be collected to characterize surface sediment nature and extent of contamination with the ISA. These include a sample from the marina to the west, two intertidal locations to the east, four subtidal locations at the base of the slope, and seven subtidal locations distributed throughout the ISA.

Surface sampling outside the ISA is needed to supplement available data regarding the quality of sediment within Port Washington Narrows (Figure B-5) that could potentially contribute to recontamination of the Site following implementation of the cleanup action. In addition, five Port Washington Narrows locations will used to determine the relative bioavailability of PAHs through ex situ porewater SPME testing. These porewater samples will be paired with associated bulk sediment and TOC data to determine how actual PAH leaching compares with leaching estimated using literature-derived partitioning coefficients.

3.1.3 Subsurface Sediment Investigation

Subsurface core sampling will be conducted to determine the vertical nature and extent of Site-related contamination (including NAPL and sheen). The subsurface explorations will be advanced at 17 sampling locations along transects aligned down the slope from the former gas works operation and 2 locations immediately west of the slope within the marina (Figure B-5). The subsurface sampling area includes the intertidal areas where with Site-related COPCs are known to be elevated and in locations of historical dock structures. The core program design is of sufficient density to evaluate migration pathways described in Section 4.2.1. To evaluate potential release pathways to the Port Washington Narrows, the deepest core in each transect targets the -20 feet MLLW elevation to acquire subsurface sediments below the approximate elevation of the channel depth of -25 feet MLLW.

At each location, a 15-foot long vibracore will be advanced until it can penetrate no further. Each core will be logged and sectioned into 1- or 2 foot intervals for testing based on visual observation and stratigraphy. Initially, two subsurface core intervals will be submitted for analysis of TS, TOC, grain size, and PAHs. All remaining core intervals will be archived for future analysis, if needed. If NAPL is identified during the processing of cores collected at the subsurface core locations, additional cores will be advanced as determined in coordination with the EPA during the planned field investigations. The core tube liner will be cut open, photographed, and physically described in accordance with ASTM D 2488 and ASTM D 2487—Unified Soil Classification System as described in Section 3.2.7.

If NAPL is identified during core processing at the subsurface bounding locations, ISA-SCSGSW-101, ISA-SCSG-102 through ISA-SCSG-105, ISA-SCSGSW-106, ISA-SCSGSW-112, ISA-SCSGSW-117, ISA-SCSGSW-118 and ISA-SCSGSW-119, an additional core offset from the initial location by approximately 20 feet. If necessary, the exact placement will be made in coordination with the EPA Project Manager or their designee. If additional cores are necessary, they will be advanced and processed as described previously in this section.

3.1.4 Beach Shellfish Surveys

Additional information is required to document the habitat conditions and the types of seafood species present within Port Washington Narrows near the Site. Clam surveys will be conducted based on Washington Department of Fish and Wildlife (WDFD) methods (Campbell 1996) using a systematic random sampling design. Shellfish surveys will be conducted at five locations within the ISA and 11 locations within the Port Washington Narrows (Figure B-3 and Figure B-5).

These data will allow a quantitative comparison between the ISA and other intertidal areas within Port Washington Narrows. In addition, the data will be used to inform sustainable shellfish yield and apply shellfish consumption rates documented in the EPA Region 10 Tribal Framework for Selecting Fish and Shellfish Consumption Rates to the baseline risk assessment.

3.1.5 Surface Water Investigation

Surface water will be sampled and analyzed at selected ISA and background locations to evaluate concentrations of site-related COCs from the Site and Port Washington Narrows (Figures B-3 and Figure B-5). These data will be collected to determine the potential of Site-related releases to surface water. To assess potential season and weather condition variability, quarterly sampling events (four) will be conducted. One of the sampling events will target a rain event, and another will target a relatively dry period.

Surface water will be collected from an appropriately outfitted sampling vessel using a 5-liter Van Dorn sampler oriented horizontally, and in situ water quality data will be collected using a Hydrolab for direct instantaneous physical characteristic measurement. At each station, samples from the following two depths within the water column will be collected: 3 feet below the water surface and 3 feet above the mudline. The surface water samples will be submitted for conventional parameters and PAHs (including alkylated). The direct Hydrolab readings for dissolved oxygen, pH, salinity, and temperature will be recorded at each depth.

These data will allow a quantitative comparison of surface water quality between the ISA and other intertidal areas within Port Washington Narrows. If elevated Site-related COC concentrations are detected at the Site, these data will support exposure human health and ecological risk assessments.

3.1.6 Tidal Currents Evaluation

Tidal surveys will be conducted by a qualified contractor along transects at the locations shown in Figure B-2. A vessel-mounted acoustic doppler current profiler will be used to measure current velocity along station transects over the course of a daily tide cycle. Measurements will be collected in both directions (i.e., back and forth) across each transect location to decrease any directional bias in the data. Current velocity measured at two depth profiles (near-bottom and mid-channel) along each transect will be used to indicate potential impacts of current velocity on sediment stability within the ISA and Port Washington Narrows.

3.1.7 Additional Sampling—As Needed

Additional sampling may be required as described in the Work Plan including additional sediment collection, contingent sediment bioassays and/or seafood tissue testing, contingent sediment geochronology, and/or treatability testing. If additional testing is necessary, an addendum will be submitted detailing sampling, processing, and analytical methods prior to the collection of this additional data.

3.1.8 Results Memoranda

Anchor QEA will prepare a Data Memorandum for the marine portion of the project. Aspect will compile this memorandum with results from the upland portion of the investigation into final documents for submittal to EPA for review and approval. This memorandum will document the results of the sampling and analysis program and, at a minimum, will contain the following information:

- A statement of the purpose of the investigation.
- A summary of the field sampling, field data, and laboratory analytical procedures (reference will be made to the final SQAPP). Deviations, whether intended or unintended, will be documented. Failure to meet sampling or data quality objectives of sufficient magnitude that lead to rejection of results will be well documented, as necessary.
- Sampling locations will be presented on associated figures. Coordinates will be reported in an accompanying table for all stations. All geographical coordinates submitted to EPA will be in the North American Datum (NAD) 83, Washington State Plane, North Zone.
- Chemical analyses results data tables summarizing chemical and conventional variables and all pertinent QA/QC data.
- An interpretation of the results against background and risk-based values.
- Copies of complete laboratory data packages as appendices or attachments.
- Copies of applicable sections of the field log as appendices or attachments.
- Copies of validation reports and/or findings.

3.2 Sampling Methods

This section describes sampling methods and includes sample identification, station positioning, surface sediment collection and processing, subsurface sediment collection and processing, surface water collection and water quality monitoring, evaluation of shellfish resources, video survey, and evaluation of tidal currents.

3.2.1 Sample Identification

Each sample will be assigned a unique alphanumeric identifier according to the following method:

- Each sample ID will be identified by the overall site (BGW) and location within the site (either ISA, Port Washington Narrows main channel [CH], or Port Washington Narrows nearshore littoral drift [LD] areas).
    - The sample collection method will be identified by one of the following sets of two letters: SG for surface sediment grab, SC for subsurface sediment core, or SW for surface water.
    - Station numbers will be added after the collection method identifier and are listed in Table B-3 and shown in Figures B-3 through B-5.
    - The date is MMDDYYYY format and will be appended to the end of the sample ID.
- Subsurface sediment sample IDs will have the depth interval (in feet) below mudline surface added after the station number (i.e., 1-2).
- Surface water sample IDs will have the collection depth (S = 3 feet below surface; B = 3 feet above bottom) added after the station number.
- Example sample identification nomenclature include:
    - BGW-ISA-SS05-032515: Surface sediment sample collected from station ISA-05 on March 25, 2015.
    - BGW-ISA-SC102-0-1-032515: Subsurface sediment sample collected at a depth interval of 1 to 2 feet below mudline at station ISA-102 on same date as above.
- A field duplicate collected from a sample will be identified by the addition of 1000 to the sample number. A duplicate sample of the above surface sediment example would be BGW-ISA-ISA-1005-032515.

Rinsate blank samples will use the overall site identifier followed by “RB,” the collection method, and date. The resulting nomenclature of a rinsate blank of the decontaminated surface grab sample processing equipment collected on March 25, 2015 would be BGW- RB-SS-032515.

3.2.2 Station Positioning

Station locations are shown in Figures B-2 through B-5. Horizontal positioning will be determined in the field by digital global positioning system (DGPS) based on target coordinates. Target coordinates are provided in Table B-3. The horizontal datum will be

NAD 83, Washington State Plane, North Zone. Measured geographical coordinates for station positions will be recorded and reported to the nearest 0.01 second. In addition, state plane coordinates will be reported to the nearest foot. The DGPS accuracy is less than 1 meter and generally less than 30 centimeters, depending on the satellite coverage and the number of data points collected.

The vertical elevation of each sediment station will be measured using a fathometer or lead line and converted to MLLW elevation. Tidal elevations will be determined based on tide predictions made by onboard computer software and using measured data from the National Oceanic and Atmospheric Administration's automated tide gauge station number 9445901, located in Dyes Inlet in Tracyton, Washington.

3.2.3 Video Survey

To conduct video surveys, an underwater video camera will be deployed from an appropriately outfitted vessel, using a winch and lowered to approximately 1 foot above the sediment surface. The camera will be lowered or raised, as needed, depending upon the geography and visibility, and towed at a speed of 1 to 2 knots along a transect at each station. GPS coordinates will be recorded along the length of the transect.

Following collection, the as-collected towed video transects will be plotted. The videos will be viewed to qualitatively determine the substrate type, habitat characteristics, presence/abundance of aquatic resources, or other significant observations, and the results will be logged. The survey will yield an interpretative figure that will present the video survey findings.

3.2.4 Intertidal Surface Sediment Collection and Processing

Surface sediments (0- to 4-inch sampling depth) will be collected from each of the intertidal sampling location shown in Figures B-2 through Figure B-5 and in accordance with the sampling summary in Table B-2. Each sample will represent a localized station composite of five equal volume aliquots. One aliquot will be collected at the target location, and the other four aliquots will be collected approximately 3 feet from the target location at the approximate four points of the compass. Sediments will be collected with decontaminated stainless steel trowels into decontaminated stainless steel bowls, homogenized, and placed into appropriate sample containers as listed in Table B-4.

3.2.5 Subtidal Surface Sediment Collection and Processing

Surface sediment samples will be collected from the 0- to 4-inch biologically active zone at locations shown in Figures B-2 through Figure B-5 and in accordance with the sampling summary in Table B-2. A hydraulic Van Veen sampling device will be used to collect subtidal surface sediment samples. The grab sampler will be lowered from a cable wire at an approximate speed of 0.3 feet per second. When the sampler reaches the mudline, the cable will be drawn taut and DGPS measurements recorded. Each surface grab sample will be retrieved aboard the vessel and evaluated for the following acceptance criteria:

- Overlying water is present and has low turbidity

- Adequate penetration depth is achieved
- Sampler is not overfilled
- Sediment surface is undisturbed
- No signs of winnowing or leaking from sampling device

Grab samples not meeting these criteria will be rejected and returned as near to the location of sample collection as possible. The vessel will be adjusted so as not to collect from the same exact location. The process will be repeated until criteria have been met. Deployments will be repeated within a 20-foot radius of the proposed sample location. If adequate penetration is not achieved after three attempts, a shallower depth of penetration will be accepted and noted in the field notebook. The sampler will be decontaminated between stations.

The following information will be recorded in the electronic field application, field log sheet, sediment sampling form, and/or the field notebook:

- Date, time, and name of person logging sample
- Weather conditions
- Sample location number and coordinates
- Project designation
- Depth of water at the location and surface elevation
- Sediment penetration and depth
- Sediment sample interval (if applicable)
- Sample recovery
- Whether the grab was accepted

Once a grab is accepted, overlying water will be siphoned off and a decontaminated stainless steel trowel, spoon, or equivalent will be used to collect the aliquot for volatile organic compound analysis by placing a representative amount from the upper 4 inches directly into the sample jar, ensuring there is no headspace, and capping the jar. Then, a decontaminated stainless steel trowel, spoon, or equivalent will be used to collect only the upper 4 inches of sediment from inside the sampler without collecting any material that is touching the sidewalls. Debris and materials more than 0.5 inch in diameter will be omitted from sample containers. Sediment will be homogenized in a pre-cleaned stainless steel bowl or tub.

In addition to sample collection, surface sediment processing will include physical characterization in accordance with the visual-manual description procedure (Method ASTM D-2488 modified). This information will be hand-written or electronically recorded on a sediment sampling form. Physical characterization includes the following elements:

- Grain size distribution

- Density and consistency
- Plasticity
- Color and moisture content
- Biological structures (e.g., shells, tubes, macrophytes, and bioturbation)
- Presence of debris and quantitative estimate (e.g., wood chips or fibers, concrete, and metal debris)
- Presence of oily sheen
- Odor (e.g., hydrogen sulfide and hydrocarbon)

Surface sediment samples collected for chemical and physical analyses will be securely packed and delivered to Analytical Resources, Inc. (ARI) in Tukwila, Washington or an equivalent EPA-accredited laboratory. Archived samples will be held at the laboratory.

3.2.6 Subsurface Sediment Collection

Subsurface sediments will be collected from a sufficiently outfitted marine sampling vessel. Subsurface sediment samples will be collected using a vibracore advanced to 15 feet or refusal depth. Vibracore sediment samples will be collected in the following manner:

1. The vessel will maneuver to the proposed sample location.
2. A clean core tube the length of the desired penetration depth will be secured to the vibratory assembly and deployed from the vessel.
3. The cable umbilical to the vibrator assembly will be drawn taut and perpendicular, as the core rests on the bottom sediment.
4. The location of the umbilical hoist will be measured and recorded by the location control personnel, and depth to sediment will be measured with a survey tape attached to the head assembly.
5. A 4-inch-diameter thin-walled aluminum tube will be vibratory-driven into the sediment using two counter-rotating vibrating heads.
6. A continuous core sample will be collected to the designated coring depth or until refusal.
7. The depth of core penetration will be measured and recorded.
8. The vibrator will be turned off, and the core barrel will be extracted from the sediment using the winch.
9. While suspended from the A-frame, the assembly and core barrel will be sprayed off and then placed on the vessel deck.
10. The length of recovered sediment will be recorded.

Cores will be evaluated to determine if they meet acceptability requirements for the project. Acceptance criteria for sediment core samples are as follows:

- Overlying water is present and the surface is intact
- The core tube appears intact without obstruction or blocking
- Recovery is greater than 75% of drive length

If sample acceptance criteria are not achieved, the sample will be rejected unless modified acceptance criteria are approved by the FC.

Anchor QEA personnel will record field conditions and drive notes on an electronic or hand-written standard core log. Logs will include the following information:

- Water depth at each station using lead line at point of sampling station
- Coordinates of each station as determined by DGPS
- Date and time of collection of each sediment core sample
- Names of field personnel collecting and handling the samples
- Observations made during sample collection, including weather conditions, complications, ship traffic, and other details associated with the sampling effort
- The sample station identification
- Length and depth intervals of each core section and estimated recovery for each sediment sample as measured from MLLW
- Qualitative notation of apparent resistance of the sediment column to coring (how the core drove)
- Any deviation from the approved SQAPP

Once the core samples are deemed acceptable, the cutterhead will be removed, and a cap will be placed over the end of the tube and secured firmly in place with duct tape. The core tube will then be removed from the sampler, and the other end of the core will be capped and taped. The core tube will be labeled with permanent black pen and scribed with the location ID and an arrow pointing to the top of core. The cores will then be cut into appropriate lengths for transport to the processing location. The cores will be sealed tightly enough to prevent leakage or disturbance during transport to the processing station. Cores will be transported daily to the processing area.

3.2.7 Subsurface Sediment Processing Methods

Subsurface cores will be processed at a suitable upland facility. Transported cores will be handled consistent with ASTM procedures (ASTM D 4220) and stored upright and cool until processed. The core caps will be removed, and the core will be cut longitudinally using electric sheers or similar. The core will be split into two halves for processing.

Prior to sampling, Anchor QEA field staff will take color photographs and record a sediment description of each core on a standard core processing log. The following parameters will be noted:

- Sample recovery
- Physical soil description in accordance with ASTM procedures (ASTM D 2488 and ASTM D 2487—Unified Soil Classification System) including soil type, density/consistency of soil, and color
- Odor (e.g., hydrogen sulfide and petroleum)
- Visual stratification, structure, and texture
- Vegetation and debris
- Biological activity (e.g., detritus, shells, tubes, bioturbation, and live or dead organisms)
- Presence of NAPL

Initially, two intervals from each core will be submitted for immediate analysis, and all other intervals will be archived for future analysis if needed. The intervals will be selected in the field by visual observations with the goal of identifying a contaminated interval, which is bounded by an uncontaminated underlying sediment. If there are no visual indications of contamination, the 1- to 2-foot interval and first native interval will be submitted. If no native sediments are identified, the two intervals will be selected based on visual observations in coordination with the FL.

Samples for each interval will be placed in a decontaminated stainless steel bowl, homogenized using a decontaminated stainless steel mixing spoon, and then spooned into laboratory-supplied jars for analyses. Sample handling requirements are presented in Table B-4. Subsurface sediment samples collected for chemical and physical analyses will be securely packed and delivered to ARI or an equivalent EPA-accredited laboratory. Archived samples will be held at the laboratory.

3.2.8 Surface Water Collection and Water Quality Monitoring

Surface water collection will occur from an appropriately outfitted sampling vessel. Surface water will be collected at two depths within the water column, 3 feet below the water surface and 3 feet above the mudline, at each station. Sampling will occur once per quarter, resulting in a total of four sampling events. A rain event and relatively dry period will be targeted for two of the sampling events.

Water samples will be collected with a 5-liter Van Dorn sampler oriented horizontally. The sampler will be attached to a rope line with both ends propped open and then lowered to the desired depth. A messenger weight will subsequently be released for travel down the line to close the sampler ends, capturing the water at the target depth. Once back onboard, the sample will be gently poured into the appropriate pre-cleaned, pre-labeled sample containers, placed in coolers filled with ice or equivalent, and maintained at 2-6 degrees Celsius (°C). Additionally, in situ water quality parameters will be measured using a Hydrolab MS5 multi-probe sonde or equivalent sonde equipped with sensors to measure dissolved oxygen, pH, temperature, and salinity. The sonde will be lowered to the desired sampling depth using a lead line to estimate depth. Measurements will be recorded on electronic or hand-written field forms.

Water samples collected for chemical and physical analyses will be securely packed and delivered to ARI or an equivalent EPA-accredited laboratory.

3.2.9 Beach Shellfish Survey Methods

Consistent with the WDFW method, the intertidal surface sample locations will be the target starting point for the shellfish survey. Stations will be approached on foot, and the surveys will be conducted during a 4-hour window centered around a low tide (-1.0 MLLW or lower). Shellfish will be harvested in accordance with the randomization procedures for identification, enumeration, and measurement (Campbell 1996).

At each target station, a sampling zone will be delineated. The "productive" area of the beach (the area containing significant clam resource) will be delineated parallel and extending to the water line. Test holes will be dug to determine the top of the clam band, and surveyor flags or similar will be used to mark the boundary. A 20-foot perpendicular sampling area will be laid out using the target sampling station as the center point. GPS coordinates will be recorded in the field notebook to note the boundaries, and photographs will be taken to provide a visual record.

Once established, the area of the sampling zone will be calculated and the number of samples will be determined. A minimum of one sample for every 4,000-square-foot block is required. Transects will be laid out perpendicular to the water line. A random number generator will be used to establish the distance (in feet) for placement of the first transect from either perpendicular boundary of the sampling zone. Another random number will be selected for placement of the first sampling point along the transect, starting from the top of the clam band. A surveyor flag or similar will be used to mark the sampling point, and GPS coordinates will be recorded in the field notebook. The second sample (and all others along the transect) will be collected at a pre-determined number of feet along the transect (based on the calculated number of samples needed). GPS coordinates will be recorded at each sampling point.

The next transect (and all remaining transects) will be placed at a fixed distance apart as determined by the block size. The first sample on every transect will be a random number of feet from the top of the clam band, and remaining samples will be placed at fixed intervals.

At each sampling point, a 1-foot hoop will be placed over the surveyor flag, and a shovel will be used to collect all sediment to a depth of 1 foot within the hoop. Recovered clams will be sorted and placed in buckets for processing. Other shellfish (such as shore crabs, oysters, and mussels) found within the sampling hoop will be noted on data sheets. Clams will be identified to species level, if possible, photographed, and enumerated by species/taxonomic group. Abundance data will be used to calculate shellfish resource density within the ISA and Port Washington Narrows and to inform the risk assessment.

3.2.10 Evaluation of Tidal Currents

Tidal surveys will be conducted by Evans Hamilton, Inc. A vessel-mounted acoustic doppler current profiler (ADCP) will be used to measure current velocity along station transects over the course of a daily tide cycle. Equipment will be calibrated to manufacturer standards and set to measure the currents throughout the water column. Measurements will be collected in both directions (i.e., back and forth) across each transect location to decrease any directional bias in the data. Vessel speed will be regulated to a maximum of 1 meter per second to reduce velocity prediction errors.

Current velocity measured at two depth profiles (near-bottom and mid-channel) along each transect will be used to indicate potential impacts of current velocity on sediment stability within the ISA and Port Washington Narrows.

3.3 Sample Handling Requirements

This section addresses the sampling program requirements for field decontamination, investigation-derived waste management, sample custody, and sample shipping requirements.

3.3.1 Field Decontamination Procedures

Sample containers, instruments, working surfaces, and other items that may come into contact with sediment sample material must meet high standards of cleanliness. All equipment and instruments used that are in direct contact with the sediment collected for analysis must be made of glass, stainless steel, high density polyethylene, or polytetrafluoroethylene. These items will be cleaned prior to each day's use and between sampling or compositing events. Decontamination of all items will follow Puget Sound Estuary Program protocols. The decontamination procedure is:

1. Pre-wash rinse with tap water or site water.
2. Wash with a solution of tap water and Alconox soap (use a brush).
3. Rinse with tap water.
4. Rinse three times with distilled water.
5. Cover (no contact) all decontaminated items with aluminum foil.
6. Store in a clean, closed container; for bowls, store inverted on a foil-covered surface for next use.

3.3.2 Investigation-derived Waste Management

Any sediment spilled on the deck of the sampling vessel will be washed into the surface waters at the collection site unless sheens or NAPL are identified during collection. Sediment remaining after surface sediment sample processing will be gently placed back onto the sediment surface at the collection location. Sediment remaining after subsurface core processing (landside) is considered investigation-derived waste (IDW) and will be collected in 5-gallon buckets or 55-gallon drums. The buckets or drums will be located in a secure area and appropriately labeled. A composite sample of IDW will be collected and chemically analyzed to obtain representative data for sediment disposal profiling.

Any surface water remaining in the grab sampler after the sample containers have been filled will be drained overboard before proceeding to the next station.

All disposable sampling materials and personal protective equipment used in sample processing, such as disposable coveralls, gloves, and paper towels, will be placed in heavy-duty garbage bags or other appropriate containers. Disposable supplies will be placed in a normal refuse container for disposal as solid waste.

3.3.3 Sample Custody and Shipping Requirements

Samples are considered to be in one's custody if they are in the custodian's possession or view; in a secured location (under lock) with restricted access; or in a container that is secured with official seals such that the sample cannot be reached without breaking the seals.

COC procedures will be followed for all samples throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the COC form. Each sample ID will be listed on an electronic or hand-written COC form the day it is collected. All data entries will be made using indelible ink pen. Corrections will be made by drawing a single line through the error, writing in the correct information, and then dating and initialing the change. Blank lines and spaces on the COC form will be lined-out, dated, and initialed by the individual maintaining custody.

A COC form will accompany each shipment of samples to the analytical laboratories. Each person who has custody of the samples will ensure that the samples are not left unattended unless properly secured. Copies of all COC forms will be retained in the project files.

All samples will be shipped or hand-delivered to the analytical laboratory no later than the day after collection. Samples collected on Friday may be held until the following Monday for shipment, provided that this does not jeopardize any hold time requirements. Specific sample shipping procedures are as follows:

- Each cooler or container holding the samples for analysis will be hand-delivered the day of sample collection, couriered, or shipped via overnight delivery to the appropriate analytical laboratory. In the event that Saturday delivery is required, the FC will contact the analytical laboratory before 3 p.m. on Friday to ensure that the laboratory is aware of the number of containers shipped and the airbill tracking numbers for those containers.
- Coolant ice will be sealed in separate plastic bags and placed in the shipping containers.
- Individual samples will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.

- If the samples are transferred using a commercial shipping company, the following procedures will be followed:
    - The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to enable positive identification.
    - The shipping waybill number will be documented on all COC forms accompanying the samples.
    - COC forms will be enclosed in a plastic bag and placed inside the cooler.
    - A minimum of two signed and dated COC seals will be placed on adjacent sides of each cooler prior to shipping.
    - Each cooler will be wrapped securely with strapping tape, labeled "Glass – Fragile" and "This End Up," and be clearly labeled with the laboratory's shipping address and the consultant's return address.

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the COC form. Upon receipt of samples at the laboratory, the person receiving the sample will sign the COC form. The shipping container seals will be broken (if applicable) and the receiver will record the condition of the samples on a sample receipt form. COC forms will be used internally in the lab to track sample handling and final disposition.

3.4 Laboratory Methods

This section includes methods for analytical chemistry for sediment, water, and porewater samples.

3.4.1 Analytical Methods –Sediment and Water Chemistry

This section summarizes the target physical and chemical analyses for the various media sampled. All sample analyses will be conducted in accordance with EPA-approved methods and this SQAPP. Prior to analyses, all samples will be maintained according to the appropriate holding times and temperatures for each analysis (Table B-4). Analytes, analytical methods, and target detection limits for chemical and physical testing are presented in Tables B-5 through B-8. The analytical laboratory will prepare a detailed report in accordance with this SQAPP.

Prior to the analysis of the samples, the laboratory will calculate MDLs for each analyte of interest, where applicable. MDLs will be below the values specified in Tables B-5 through B-8, if technically feasible. To achieve the required detection limits, some modifications to the methods may be necessary. These modifications from the specified analytical methods will be provided by the laboratory at the time of establishing the laboratory contract. The modifications must be approved by EPA prior to implementation.

Chemical/physical testing will be conducted at ARI and SGS. ARI and SGS are accredited under the National Environmental Laboratories Accreditation Program. All chemical and physical testing will adhere to the most recent EPA QA/QC procedures outlined in the approved analytical methods and in this SQAPP. If more current analytical methods are available, the laboratories will use them.

In completing chemical analyses for this project, the contract laboratories are expected to meet the following minimum requirements:

- Adhere to the methods outlined in this SQAPP, including methods referenced for each analytical procedure (Tables B-5 through B-8)
- Deliver electronic data as specified
- Meet reporting requirements for deliverables
- Meet turnaround times for deliverables
- Implement QA/QC procedures discussed in this SQAPP including DQOs, laboratory quality control requirements, and performance evaluation testing requirements
- Notify the project QA/QC Manager of any SQAPP QA/QC problems when they are identified to allow for quick resolution
- Allow laboratory and data audits to be performed, if deemed necessary

3.4.2 Analytical Methods—Porewater

To determine the relative ex situ bioavailability of PAHs in surface sediment porewater, SPME fibers will be inserted into each sample at Anchor QEA's geochemical laboratory in Portland, Oregon. The SPME will equilibrate with the porewater over a period of approximately 1 month under laboratory conditions with mild agitation. Performance reference compounds will be pre-spiked into the SPME fibers to confirm that equilibrium conditions are achieved. The SPME fibers will then be removed from the sediments and submitted for analytical testing to SGS for PAHs and alkylated PAHs. Porewater analytes and methods are listed in Table B-8.

3.5 Quality Assurance/Quality Control

Field and laboratory activities will be conducted in such a manner that the results meet specified quality objectives and are fully defensible. Guidance for QA/QC is derived from the protocols developed for EPA SW-846 (1986), the EPA Contract Laboratory Program (EPA 1999, 2004, 2005), and the cited methods.

3.5.1 Field Quality Control

Anchor QEA personnel will identify and label samples in a consistent manner to ensure that field samples are traceable. Labels should be used in conjunction with the COCs and this SQAPP to provide all information necessary for the laboratory to conduct required analyses properly. QA samples will be collected in the field to ensure project DQOs are met. Samples will be placed in appropriate containers and preserved for shipment to the laboratory in accordance with the requirements presented in Table B-4.

3.5.1.1 Field Quality Assurance Sampling

Field QA procedures will consist of following procedures for acceptable practices for collecting and handling of samples. This also includes periodic and routine equipment inspection.

Field QA samples will be collected along with the environmental samples. Field QA samples are useful in identifying possible problems resulting from sample collection or sample processing in the field. The collection of field QA samples includes equipment rinsate blanks and field duplicates. Rinsate blanks will be collected at a frequency of one per collection method per event. If target analytes are detected in the rinsate blank at levels above the RLs, decontamination procedures will be reviewed and modified and additional blanks collected until the source of contamination has been eliminated or reduced to acceptable levels. Field duplicates will be collected at a frequency of one per sampling event or one in 20 sample locations processed (whichever is more frequent).

Field QA samples will also include the collection of additional sample mass or volume as required to ensure that the laboratory has sufficient sample mass or volume to run the matrix-specified analytical QA/QC (matrix duplicate [MD]/MS/MS duplicate [MSD]) samples for analyses as specified in Table B-1. Additional sample mass or volume to meet this requirement will be collected at a frequency of one per sampling event or one in 20 samples processed, whichever is more frequent. The samples designated for MD/MS/MSD analyses should be clearly marked on the COC.

All field QA samples will be documented on the field forms and verified by the QA/QC Manager or designee.

3.5.1.2 Sample Containers

Sample containers and preservatives will be provided by the laboratory. The laboratory will maintain documentation certifying the cleanliness of bottles and the purity of preservatives provided. Container requirements are listed in Table B-4.

3.5.1.3 Sample Identification and Labels

Each sample will have an adhesive plastic or waterproof paper label affixed to the container and will be labeled at the time of collection. The following information will be recorded on the container label at the time of collection:

- Project name
- Sample identification
- Date and time of sample collection
- Preservative type (if applicable)
- Analysis to be performed

3.5.2 Laboratory Quality Control

Laboratory quality control procedures, where applicable, include initial and continuing instrument calibrations, standard reference materials, laboratory control samples, matrix replicates, matrix spikes, surrogate spikes (for organic analyses), and method blanks. A summary of the DQOs is provided in Table B-1. QA/QC sample frequencies are provided in Table B-9.

An analyst will review the results of the quality control samples from each sample group immediately after a sample group has been analyzed. The quality control sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the QA/QC Manager will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

3.5.2.1 Laboratory Instrument Calibration and Frequency

An initial calibration will be performed on each laboratory instrument to be used prior to the start of project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet method control criteria. Calibration verification will be analyzed following each initial calibration and will meet method criteria prior to analyses of samples. Continuing calibration verifications (CCV) will be analyzed at method-required frequencies to track instrument performance. The frequency of CCVs varies with method. For gas chromatography (GC)/mass spectrometer methods, one will be analyzed every 12 hours. For GC, metals, and inorganic methods, one will be analyzed for every 10 field samples analyzed and at the end of each run. If the continuing calibration is out of control, the analysis will be terminated until the source of the control failure is eliminated or reduced to meet control specifications, which may include analyzing a new initial calibration. Any project samples analyzed while the instrument calibration was out of control will be reanalyzed.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately prior to continuing calibration verification at the instrument for each type of applicable analysis.

3.5.2.2 Laboratory Duplicates/Replicates

Analytical duplicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical duplicates and replicates are subsamples of the original sample that are prepared and analyzed as a separate sample.

3.5.2.3 Matrix Spikes and Matrix Spike Duplicates

Analyses of MS samples provide information on the extraction efficiency of the method on the sample matrix, as well as any interferences introduced by the sample matrix. By performing duplicate MS (MSD) analyses, information on the precision of the method is also provided.

3.5.2.4 Method Blanks

Method blanks are prepared and analyzed in the same manner as project samples to assess possible laboratory contamination at all stages of sample preparation and analysis. The method blank for all analyses must be less than the method reporting limit of any single target analyte/compound. If a laboratory method blank exceeds this criterion for any analyte/compound, and the concentration of the analyte/compound in any of the samples is less than five times the concentration found in the blank (10 times for common contaminants), analyses must stop and the source of contamination must be eliminated or reduced. Affected samples should be reprepared and reanalyzed, if possible.

3.5.2.5 Laboratory Control Samples

Laboratory control samples are analyzed to assess possible laboratory bias at all stages of sample preparation and analysis. The laboratory control sample is a matrix-dependent spiked sample prepared at the time of sample extraction along with the preparation of the sample, MS, and method blank. The laboratory control sample will provide information on the precision of the analytical process, and when analyzed in duplicate, will provide accuracy information as well.

3.5.2.6 Laboratory Deliverables

Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. The analytical laboratory will be required, where applicable, to report the following:

- **Project Narrative**. This summary, in the form of a cover letter, will include a discussion of any problems encountered during analyses. This summary should include (but not be limited to) QA/QC, sample shipment, sample storage, and analytical difficulties. Any problems encountered, actual or perceived, and their resolutions will be documented in as much detail as appropriate.

- **Chain-of-Custody Records**. Legible copies of the COC forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented on a sample receipt form. The form must include sample shipping container temperatures measured at the time of sample receipt.

- **Sample Results**. The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:

  - Field sample identification code and the corresponding laboratory identification code

  - Sample matrix

  - Date of sample preparation/extraction

    - Date and time of analysis
    - Mass and/or volume used for preparation and analysis
    - Final dilution or concentration factors for the sample
    - Identification of the instrument used for analysis
    - MDLs and method RLs accounting for sample-specific factors (e.g., dilution and TS)
    - Analytical results with reporting units identified
    - Data qualifiers and their definitions
    - An electronic data deliverable with data in a format specified in advance by Anchor QEA

- **QA/QC Summaries**. This section will contain the results of the laboratory QA/QC procedures. Each QA/QC sample analysis will be documented with the same information required for the sample results. No recovery or blank corrections will be made by the laboratory. The required summaries are as follows (additional information may be requested):

    - **Calibration Data Summary**. This summary will report the concentrations of the initial calibration and daily calibration standards and the date and time of analysis. The response factor, percent relative standard deviation, percent difference, and retention time for each analyte will be listed, as appropriate. Calibration results for standards will be documented to indicate instrument sensitivity.
    - **Internal Standard Area Summary**. The stability of internal standard areas will be reported.
    - **Method Blank Analysis**. The method blank analysis associated with each sample and the concentration of all compounds of interest identified in these blanks will be reported.
    - **Surrogate Spike Recovery**. All surrogate spike recoveries for organic analyses will be reported. The name and concentration of all compounds added, percent recoveries, and range of acceptable recoveries will be provided.
    - **MS Recovery**. MS recovery data for all applicable analyses will be reported. The names and concentrations of compounds added, percent recoveries, and range of acceptable recoveries will be listed. The percent recoveries and RPD values for MS duplicate analyses will be reported.
    - **Matrix Duplicate**. The RPD values for matrix duplicate analyses will be reported.
    - **Laboratory Control Sample**. Laboratory control sample recovery data will be reported. The names and concentrations of compounds added, percent recoveries, and range of acceptable recoveries will be included.

The percent recoveries and RPD values for laboratory control sample duplicate analyses will be included.

  - **Relative Retention Time**. Relative retention times of each analyte detected in the samples for both primary and conformational analyses will be reported.

- **Original Data**. Legible copies of the original data generated by the laboratory will include the following information:
  - Sample extraction, preparation, and cleanup logs including methods used
  - Instrument analysis logs for all instruments used on days of calibration and sample analyses
  - Calculation worksheets as applicable
  - Ion chromatograms for all samples, standards, blanks, calibrations, spikes, replicates, and reference materials
  - Copies of full scan chromatograms and quantitation reports for GC and/or GC/mass spectrometer analyses of samples, standards, blanks, calibrations, spikes, replicates, and reference materials
  - Enhanced spectra of detected compounds with associated best-match spectra for each sample

3.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

This section describes procedures for testing, inspection, and maintenance of field and laboratory equipment.

3.6.1 Field Instruments/Equipment

In accordance with the QA program, Anchor QEA shall maintain an inventory of field instruments and equipment. The frequency and types of maintenance will be based on the manufacturer's recommendations and/or previous experience with the equipment.

The Anchor QEA FC will be responsible for the preparation, documentation, and implementation of the preventative maintenance program. The equipment maintenance information will be documented in the instrument's calibration log. The frequency of maintenance is dependent on the type and stability of the equipment, the methods used, the intended use of the equipment, and the recommendations of the manufacturer. Detailed information regarding the calibration and frequency of equipment calibration is provided in each specific manufacturer's instruction manuals.

All maintenance records will be verified prior to each sampling event. The FC will be responsible for verifying that required maintenance has been performed prior to using the equipment in the field. For this project, maintenance inspections will include the following activities:

- The subcontractor responsible for navigation will confirm proper operation of the navigation equipment daily. This verification may consist of internal diagnostics or visiting a location with known coordinates to confirm the coordinates indicated by the navigation system.
- The winch line, as well as sediment and water samplers, will be inspected daily for fraying, misalignment, loose connections, and any other applicable mechanical problems.
- The underwater camera will be tested prior to deployment to ensure no electrical or mechanical problems exist.
- The subcontractor responsible for the tidal current surveying will ensure ADCPs are in good working order prior to use in the field.

Any problems will be noted in the field logbook and corrected prior to continuing sampling operations.

3.6.2 Laboratory Instruments/Equipment

In accordance with the QA program, the laboratory shall maintain an inventory of instruments and equipment, and the frequency of maintenance will be based on the manufacturer's recommendations and/or previous experience with the equipment.

The laboratory preventative maintenance program, as detailed in the laboratory QA Plan, is organized to maintain proper instrument and equipment performance and to prevent instrument and equipment failure during use. The program considers instrumentation, equipment, and parts that are subject to wear, deterioration, or other changes in operational characteristics, the availability of spare parts, and the frequency at which maintenance is required. Any equipment that has been overloaded, mishandled, gives suspect results, or has been determined to be defective will be taken out of service, tagged with the discrepancy noted, and stored in a designated area until the equipment has been repaired. After repair, the equipment will be tested to ensure that it is in proper operational condition. The client will be promptly notified in writing if defective equipment casts doubt on the validity of analytical data. The client will also be notified immediately regarding any delays due to instrument malfunctions that could impact holding times.

Laboratories will be responsible for the preparation, documentation, and implementation of the preventative maintenance program. Maintenance records will be checked according to the schedule on an annual basis and recorded by laboratory personnel. The Laboratory QA/QC Manager or designee shall be responsible for verifying compliance.

3.6.2.1 Laboratory Instrument/Equipment Calibration

As part of their quality control program, laboratories perform two types of calibrations. A periodic calibration is performed at prescribed intervals (e.g., balances, drying ovens, refrigerators, and thermometers), and operational calibrations are performed daily at a specified frequency or prior to analysis (i.e., initial calibrations) according to method requirements. Calibration procedures and frequency are discussed in the laboratory QA Plan. Calibrations are discussed in the laboratory standard operating procedures (SOPs) for analyses.

The Laboratory QA/QC Manager will be responsible for ensuring that the laboratory instrumentation is calibrated in accordance with specifications. Implementation of the calibration program will be the responsibility of the respective laboratory Group Supervisors. Recognized procedures (EPA, ASTM, or manufacturer's instructions) will be used when available.

Physical standards (i.e., weights or certified thermometers) will be traceable to nationally recognized standards such as the National Institute of Standards and Technology (NIST). Chemical reference standards will be NIST standard reference materials or vendor-certified materials traceable to these standards.

The calibration requirements for each method and respective corrective actions will be accessible, either in the laboratory SOPs or in the laboratory's QA Plan for each instrument or analytical method in use. All calibrations will be preserved on electronic media.

3.7 Inspection/Acceptance of Supplies and Consumables

Inspection and acceptance of field supplies, including laboratory-prepared sampling bottles, will be performed by the FC. All primary chemical standards and standard solutions used for this project, either in the field or laboratory, will be traceable to documented, reliable commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities found in the standard will be documented.

3.8 Non-direct Measurements

Existing data suitable for use in the in the production of the RI/FS report has been identified in the Scoping Memorandum (in prep) and RI/FS Work Plan.

3.9 Data Management

Field data sheets will be checked for completeness and accuracy by the FC prior to delivery to the Data Manager. Data generated in the field will be documented on electronic or hard copy and provided to the Data Manager, who is responsible for the data entry into the database. All manually-entered data will be verified by a second party. Field documentation will be filed in the main project file after data entry and verification are complete.

Laboratory data will be provided to the Data Manager in the EQuIS electronic format. Laboratory data that is electronically provided and loaded into the database will undergo a check against the laboratory hard copy data. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. The accuracy of all manually-entered data will be verified by a second party. Data tables and reports will be exported from EQuIS to Microsoft Excel tables.

4 Assessments and Response Actions

Once data are received from the laboratory, a number of quality control procedures will be followed to provide an accurate evaluation of the data quality. Specific procedures will be followed to assess data precision, accuracy, and completeness.

4.1 Compliance Assessments

Laboratory and field performance audits consist of on-site reviews of QA systems and equipment for sampling, calibration, and measurement. Laboratory audits will not be conducted as part of this study. However, all laboratory audit reports will be made available to the project QA/QC Manager upon request. The laboratory is required to have written procedures addressing internal QA/QC. These procedures have been submitted and the project QA/QC Manager will review them to ensure compliance with this SQAPP. The laboratory must ensure that personnel engaged in analytical tasks have appropriate training. The laboratory will provide written details of any and all method modifications planned prior to project commencement.

4.2 Response and Corrective Actions

The following paragraphs identify the responsibilities of key project team members and actions to be taken in the event of an error, problem, or non-conformance to protocols identified in this document.

4.2.1 Field Activities

The FC will be responsible for correcting equipment malfunctions during the field sampling effort. The project QA/QC Manager will be responsible for resolving situations identified by the FC that may result in non-compliance with this SQAPP. All corrective measures will be immediately documented in the field logbook.

4.2.2 Laboratory

The laboratory is required to comply with its SOPs. The Laboratory Project Manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this SQAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.

The Laboratory Project Manager will be notified immediately if any quality control sample exceeds the project-specified control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. If the laboratory internal corrective action does not resolve the non-conformance, the Laboratory Project Manager will notify the QA/QC Manager. A narrative describing the anomaly, the steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, and re-extraction) will be submitted with the data package in the form of a cover letter.

4.3 Reports to Management

QA reports to management include verbal status reports, data validation reports, and final project reports. These reports shall be the responsibility of the QA/QC Manager.

5 Data Validation and Usability

This section describes the processes that will be used to review project data quality.

5.1 Data Review, Validation, and Verification

During the validation process, analytical data will be evaluated for project, method, and laboratory quality control compliance, and their validity and applicability for program purposes will be determined. Based on the findings of the validation process, data validation qualifiers may be assigned. The validated project data, including qualifiers, will be entered into the project database, thus enabling this information to be retained or retrieved, as needed.

5.2 Validation and Verification Methods

Data validation includes signed entries by the field and laboratory technicians on field data sheets and laboratory datasheets, respectively; review for completeness and accuracy by the FC and Laboratory Manager; review by the Data Manager for outliers and omissions; and the use of quality control criteria to accept or reject specific data. All data will be entered into the EQuIS database and a raw data file printed or exported. A second data manager or designee will perform a cursory verification of the database raw data file. If errors are found, further verification will be performed to ensure that all data are accurate. Any errors found will be corrected in the database.

All laboratory data will be reviewed and verified to determine whether DQOs have been met and that appropriate corrective actions have been taken, when necessary. The project QA/QC Manager or designee will be responsible for the final review of data generated from analyses of samples.

The first level of review will take place in the laboratory as the data are generated. The laboratory department manager or designee will be responsible for ensuring that the data generated meet minimum QA/QC requirements and that the instruments were operating under acceptable conditions during generation of data. DQOs will also be assessed at this point by comparing the results of quality control measurements with pre-established criteria as a measure of data acceptability.

The analysts and/or laboratory department manager will prepare a preliminary quality control checklist for each parameter and for each sample delivery group (SDG) as soon as analysis of an SDG has been completed. Any deviations from the DQOs listed on the checklist will be brought to the attention of the Laboratory Manager to determine whether corrective action is needed and to determine the impact on the reporting schedule.

Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. Stage 2B validation (EPA 2009) will be conducted on 90% of the data and Stage 4 validation (EPA 2009) on 10%. Data validation will be conducted by a reviewer using current National

Functional Guidelines data validation requirements (EPA 1999, 2004, 2005, 2008) by considering the following information, as applicable:

- COC documentation and sample receipt condition
- Holding times
- Instrument performance checks
- Initial calibrations
- Continuing calibrations
- Method blanks
- Surrogate recoveries
- Internal standard recoveries
- Detection limits
- Reporting limits
- Laboratory control samples
- MS/MSD samples
- Field and laboratory duplicates
- Rinsate blanks
- Standard reference material results
- Raw data review

The data will be validated in accordance with the project-specific DQOs described above, analytical method criteria, and the laboratory's internal performance standards based on their SOPs.

5.3 Reconciliation with User Requirements

The QA/QC Manager will review data after each survey to determine if DQOs have been met. If data do not meet the project's specifications, the QA/QC Manager will review the errors and determine if the problem is due to calibration/maintenance, sampling techniques, or other factors and will suggest corrective action. Retraining, revision of techniques, or replacement of supplies/equipment should correct the problem; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA/QC Manager will recommend appropriate modifications. Any revisions will require approval by EPA.

6 References

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TABLES

Table B-1
Data Quality Objectives

Matrix	Parameter	Precision	Accuracy	Completeness
Sediment	TS/Grain size	± 20% RPD	NA	95%
	TOC/DOC	± 30% RPD	65-135% R	95%
	Total Cyanide	± 30% RPD	75-125% R	95%
	Metals	± 30% RPD	75-125% R	95%
	VOCs/SVOCs/PAHs	± 35% RPD	50-150% R	95%
	PCDD/PCDF Congeners	± 35% RPD	50-150% R	95%
Water	TSS	± 20% RPD	NA	95%
	TOC/DOC	± 20% RPD	70-130% R	95%
	Total/WAD Cyanide	± 20% RPD	80-120% R	95%
	PAHs	± 30% RPD	60-140% R	95%

Notes:
TS - total solids
DOC - dissolved organic carbon
PAHs - polycyclic aromatic hydrocarbons
PCDD/PCDF - polychlorinated dibenzodioxin/polychlorinated dibenzofuran
R - recovery
RPD - relative percent difference
SVOCs - semivolatile organic compounds
TOC - total organic carbon
TSS - total suspended solids
VOCs - volatile organic compounds

Table B-2
Marine Sampling Design Summary

Area	Sub-Area	Sample Type	Purposes	Number of Samples and Location Rationale	Primary Testing Parameters [1]
Sediment Sampling					
Initial Study Area	Co-Located Intertidal and Subtidal Sediment Grabs and Cores	Intertidal Grab Samples	To define the horizontal nature and extent of contamination in intertidal sediments	Bulk chemistry at 5 intertidal stations collected throughout beach area adjacent to former Gas Works and ravine	PAHs (including alkylated), TS, TOC, grain size
			Evaluate concentrations of metals, SVOC and cyanide along Gas Works intertidal area	Supplemental testing for bulk chemistry at 5 intertidal stations adjacent to former Gas Works and ravine	Cyanide (total and available), metals and SVOC
			Evaluate pore-water concentrations of PAH and alkylated PAH concentrations	Pore-Water chemistry at 5 intertidal stations	PAHs (including alkylated) in pore-water
		Subtitdal Grab Samples	To define the horizontal nature and extent of contamination in subtidal sediments	14 subtidal stations collected in transects down the slope toward to the channel elevation.	PAHs (including alkylated), TS, TOC, grain size
		Vibracores	To define the vertical nature and extent of contamination in intertidal and subtidal sediments in including NAPL and Sheens	5 intertidal and 14 subtidal stations Advanced in transects down the slope toward to the channel elevation and two within the marina.	PAHs, TS, TOC
	Other Intertidal and Subtidal Sediment Grabs	Intertidal Grabs	Provide bounding to the nature & extent of site-associated impacts in intertidal sediment	2 stations Step-out sampling in accessible intertidal areas within eastern extent of the ISA. The western intertidal extent is a rip rap armored slope and not generally accessible.	PAHs (including alkylated), TS, TOC, grain size
		Subtidal Grabs	To define the horizontal nature and extent of contamination in subtidal sediments	14 stations Step-out sampling between slope area and ISA boundary.	PAHs (including alkylated), TS, TOC, grain size
Port Washington Narrows	Intertidal	Surface Grab (Multi-Increment Composite)	Document quality of intertidal sediments within Port Washington Narrows to provide an estimate of recontamination potential from sediment movement (littoral drift and bed load) and deposition	11 stations Collection along north side and five along the south side of the narrows. Stations placed in publically accessible intertidal areas.	PAHs (including alkylated), TS, TOC, grain size
			Evaluate relationship between predicted and actual pore-water concentrations of PAH and alkylated PAH	5 stations Representative samples of Narrows intertidal samples (every other sample). Allows estimate of central tendency.	PAHs (including alkylated)
	Subtidal (Channel Bottom)	Surface Grab	Document quality of intertidal sediments within Port Washington Narrows to provide an estimate of recontamination potential from sediment movement (sediment bed load) and deposition	6 stations Collection along the general centerline and deeper sections of the channel.	PAHs (including alkylated), TS, TOC, and Grain Size
Surface Water Sampling					
Initial Study Area	Surface Water	Grab	Quantify concentrations of site-associated COPCs in surface water	2 locations Seasonal sampling at 2 depths per location	Conventional Parameters, PAHs (including alkylated)
Port Washington Narrows		Grab	Quantify concentrations of COPCs in surface water to assess potential regional influences	2 locations Seasonal sampling at 2 depths per location	Conventional Parameters, PAHs (including alkylated)
Habitat and Physical Surveys					
Initial Study Area and Port Washington Narrows	Intertidal	Visual & Photo Survey	Conduct surveys of aquatic habitat and fish/shellfish resources near the Site within Port Washington Narrows.	5 locations within ISA intertidal area, and 11 locations within Port Washington Narrows	Visual survey for clam identification and abundance
	Subtidal	Towed-Camera Survey	Refine environmental setting information	6 transects perpendicular to and 5 transects in parallel with the Port Washington Narrows	Mapping of substrate, vegetation and identified aquatic species
Initial study area	Subtidal	ADCP Transects	Measure Near-bottom currents that may impact sediment stability	4 transects perpendicular to Port Washington Narrows (2 tide conditions)	Conduct empirical measurements of near-bottom and mid-channel tidal currents for use in an analysis of sediment stability.

Notes:

1. Samples to be archived frozen for contingent analysis should additional testing be required for SVOC or heavy metals.

PAH = polynuclear aromatic hydrocarbons
NA = not applicable
TOC = total organic carbon
NAPL = non-aqueous phase liquid
SVOC = semi-volatile organic compound
TS = total solids
TBD = to be determined
ADCP = acoustic doppler current profiler
COPCs = chemicals of potential concern

Table B-3
Station Identifications and Locations

Study Area	Station ID	Easting[1]	Northing[1]
Initial Study Area Surface, Subsurface, and Surface Water Locations	ISA-SCSGSW-101	1193688.784	216498.983
	ISA-SCSG-102	1193774.604	216482.840
	ISA-SCSG-103	1193854.303	216467.049
	ISA-SCSG-104	1193950.143	216428.205
	ISA-SCSG-105	1194048.715	216388.695
	ISA-SCSGSW-106	1194156.147	216343.606
	ISA-SCSG-107	1193663.181	216444.182
	ISA-SCSG-108	1193760.353	216425.785
	ISA-SCSG-109	1193831.527	216408.631
	ISA-SCSG-110	1193928.000	216365.027
	ISA-SCSG-111	1194023.669	216337.409
	ISA-SCSG-112	1194142.000	216285.707
	ISA-SCSG-113	1193645.093	216371.871
	ISA-SCSG-114	1193807.793	216340.235
	ISA-SCSG-115	1193912.655	216316.039
	ISA-SCSG-116	1193982.057	216218.338
	ISA-SCSG-117	1194123.229	216224.739
	ISA-SCSG-118	1193524.268	216558.476
	ISA-SCSG-119	1193503.752	216482.808
Initial Study Area Grab Sample	ISA-SG-01	1193322.170	217466.790
	ISA-SG-02	1194184.215	216985.964
	ISA-SG-03	1195383.762	216703.164
	ISA-SG-04	1193168.980	217043.114
	ISA-SG-05	1193635.017	216821.061
	ISA-SG-06	1194011.201	216665.342
	ISA-SG-07	1194609.467	216393.870
	ISA-SG-08	1195204.924	216139.429
	ISA-SG-09	1193367.549	216544.075
	ISA-SG-10	1193633.548	216640.648
	ISA-SG-11	1193829.236	216575.419
	ISA-SG-12	1194060.503	216506.801
	ISA-SG-13	1194292.617	216435.642
	ISA-SG-14	1194545.854	216024.606
Channel Sediment Grab (Bed Load Sediment) and Surface Water Locations	CH-SGSW-01	1191969.706	218980.972
	CH-SG-02	1192545.457	218110.359
	CH-SG-03	1194332.242	217289.788
	CH-SG-04	1197339.407	216449.449
	CH-SG-05	1196114.321	216817.263
	CH-SGSW-06	1197576.165	216404.229

Table B-3
Station Identifications and Locations

Study Area	Station ID	Easting[1]	Northing[1]
Littoral Drift Sediment Grab Locations (North and South Zones)	LD-N-SG-01	1192765.408	219327.786
	LD-N-SG-02	1193266.571	218880.979
	LD-N-SG-03	1193612.319	218183.438
	LD-N-SG-04	1195532.976	217331.490
	LD-N-SG-05	1196242.871	217278.699
	LD-N-SG-06	1197704.179	216679.902
	LD-S-SG-01	1191567.870	218823.106
	LD-S-SG-02	1192273.608	217881.804
	LD-S-SG-03	1192908.400	216565.398
	LD-S-SG-04	1195937.771	216183.527
	LD-S-SG-05	1197252.454	215369.341

Notes:

1. Horizontal datum is Washington State Plane North NAD83 USFt

CH = channel sampling location

ISA = initial study area

LD = littoral drift sampling location

N = north

S = south

SC = sediment core sample location

SS = sediment grab sample location

SW = surface water sample location

Table B-4
Guidelines for Sample Handling and Storage

Media	Analyte	Container	Holding Time	Preservative
Sediment	Total solids and TOC	4-oz glass jar	14 days	Cool/4°C
			6 months	Freeze -18°C
	Cyanide	4-oz glass jar	14 days	Cool/4°C
	Grain size	16-oz glass or plastic jar	none	Cool/4°C
	Metals	4-oz glass jar	6 months; 28 days for Hg	Cool/4°C
			2 years	Freeze[a]/-18°C
	VOCs	2-oz glass jar, no headspace	14 days	Cool/4°C
	SVOCs	16-oz glass jar	14 days until extraction	Cool/4°C
			1 year until extraction	Freeze/-18°C
			40 days after extraction	Cool/4°C
	PCDD/PCDF Congeners	4-oz glass jar	1 year until extraction	Freeze -18°C
			1 year after extraction	Freeze -18°C
	Archive	8 or 16-oz glass jar	--	Freeze/-18°C
Water	TOC	250 mL Amber glass	28 days	Cool/4°C; H_2SO_4 to pH<2
	DOC[b]	250 mL Amber glass	28 days	Cool/4°C; H_2SO_4 to pH<2
	Total cyanide	500 mL HDPE	14 days	Cool/4°C; NaOH to pH>12
	WAD cyanide	500 mL HDPE	14 days	Cool/4°C; NaOH to pH>12
	TSS	1L HDPE	7 days	Cool/4°C
	PAHs	2 x 500mL Amber glass	7 days to extraction	Cool/4°C
			40 days after extraction	Cool/4°C

Notes:

a - Mercury will be analyzed prior to freezing

b - DOC will be field-filtered

DOC - dissolved organic carbon

PAHs - Polycyclic aromatic hydrocarbons

PCDD/PCDF - polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans

SVOC -semivolatile organic compound

TOC - total organic carbon

VOC - volatile organic compound

WAD - weak acid dissociable

Table B-5
Surface Sediment Analyte List, Analytical Methods, and Reporting Limits

Analyte	Analytical Method	Target Reporting Limit[a]
Conventionals and Physical Tests		
Total solids (%)	SM 2540B	0.1
Total organic carbon (%)	Plumb, 1981	0.1
Grain size (%)	PSEP	0.1
Cyanide (mg/kg)	SM 4500-CN	0.25
Metals (mg/kg)		
Mercury	7471A	0.025
Arsenic	6020A	0.5
Cadmium	6020A	0.1
Chromium	6020A	0.5
Copper	6020A	0.5
Lead	6020A	0.1
Nickel	6020A	0.5
Selenium	6020A	0.5
Silver	6020A	0.2
Zinc	6020A	4.0
Volatile Organic Compounds (µg/kg)		
Benzene	8260C	1.0
Toluene	8260C	1.0
Ethylbenzene	8260C	1.0
m,p-Xylene	8260C	1.0
o-Xylene	8260C	1.0
Semivolatile Organics (µg/kg)		
PAHs and Alkyl PAHs		
1-Methylnaphthalene	8270D/SIM	5.0/20
2-Methylnaphthalene	8270D/SIM	5.0/20
Acenaphthene	8270D/SIM	5.0/20
Acenaphthylene	8270D/SIM	5.0/20
Anthracene	8270D/SIM	5.0/20
Benzo(a)anthracene	8270D/SIM	5.0/20
Benzo(a)pyrene	8270D/SIM	5.0/20
Benzo(e)pyrene	8270D/SIM	5.0/20
Benzo(b+j+k)fluoranthenes	8270D/SIM	5.0/20
Benzo(g,h,i)perylene	8270D/SIM	5.0/20
C1-Benzanthracenes/Chrysenes	8270D/SIM	10
C1-Fluoranthenes/Pyrenes	8270D/SIM	10
C1-Fluorenes	8270D/SIM	10
C1-Naphthalenes	8270D/SIM	10
C1-Phenanthrenes/Anthracenes	8270D/SIM	10
C2-Benzanthracenes/Chrysenes	8270D/SIM	10
C2-Fluorenes	8270D/SIM	10
C2-Naphthalenes	8270D/SIM	10
C2-Phenanthrenes/Anthracenes	8270D/SIM	10

Table B-5
Surface Sediment Analyte List, Analytical Methods, and Reporting Limits

Analyte	Analytical Method	Target Reporting Limit[a]
C3-Benzanthracenes/Chrysenes	8270D/SIM	10
C3-Fluorenes	8270D/SIM	10
C3-Naphthalenes	8270D/SIM	10
C3-Phenanthrenes/Anthracenes	8270D/SIM	10
C4-Benzanthracenes/Chrysenes	8270D/SIM	10
C4-Naphthalenes	8270D/SIM	10
C4-Phenanthrenes/Anthracenes	8270D/SIM	10
Chrysene	8270D/SIM	5.0/20
Dibenz(a,h)anthracene	8270D/SIM	5.0/20
Fluoranthene	8270D/SIM	5.0/20
Fluorene	8270D/SIM	5.0/20
Indeno(1,2,3-cd)pyrene	8270D/SIM	5.0/20
Naphthalene	8270D/SIM	5.0/20
Phenanthrene	8270D/SIM	5.0/20
Perylene	8270D/SIM	5.0/20
Pyrene	8270D/SIM	5.0/20
Chlorinated Benzenes		
1,2-Dichlorobenzene	8270D	20
1,4-Dichlorobenzene	8270D	20
1,2,4-Trichlorobenzene	8270D	20
Hexachlorobenzene	8270D	20
Phenols		
Pentachlorophenol	8270D	100
Phenol	8270D	20
2,4-Dimethylphenol	8270D	100
2-Methylphenol (o-Cresol)	8270D	20
4-Methylphenol (p-Cresol)	8270D	20
Phthalates		
bis(2-Ethylhexyl)phthalate	8270D	50
Butylbenzyl phthalate	8270D	20
Diethyl phthalate	8270D	20
Dimethyl phthalate	8270D	20
Di-n-butyl phthalate	8270D	20
Di-n-octyl phthalate	8270D	20
Miscellaneous		
Dibenzofuran	8270D/SIM	5.0/20
Hexachlorobutadiene	8270D	20
Hexachloroethane	8270D	20
Benzyl Alcohol	8270D	20
Benzoic Acid	8270D	200
PCDD/PCDF (ng/kg)		
2,3,7,8-TCDD	1613B	0.5
1,2,3,7,8-PeCDD	1613B	2.5

Table B-5
Surface Sediment Analyte List, Analytical Methods, and Reporting Limits

Analyte	Analytical Method	Target Reporting Limit[a]
1,2,3,4,7,8-HxCDD	1613B	2.5
1,2,3,6,7,8-HxCDD	1613B	2.5
1,2,3,7,8,9-HxCDD	1613B	2.5
1,2,3,4,6,7,8-HpCDD	1613B	2.5
OCDD	1613B	5.0
2,3,7,8-TCDF	1613B	0.5
1,2,3,7,8-PeCDF	1613B	2.5
2,3,4,7,8,-PeCDF	1613B	2.5
1,2,3,4,7,8-HxCDF	1613B	2.5
1,2,3,6,7,8-HxCDF	1613B	2.5
1,2,3,7,8,9-HxCDF	1613B	2.5
2,3,4,6,7,8-HxCDF	1613B	2.5
1,2,3,4,6,7,8-HpCDF	1613B	2.5
1,2,3,4,7,8,9-HpCDF	1613B	2.5
OCDF	1613B	5.0

Notes:

[a] Reporting limits may vary based on sample size, moisture content, target analyte concentrations, and matrix interference

NA - not applicable to this analyte

PAH - polycyclic aromatic hydrocarbon

PCDD/PCDF - polychlorinated dibenzo-p-dioxins/ polychlorinated dibenzofurans

Table B-6
Subsurface Sediment Analyte List, Analytical Methods, and Reporting Limits

Analyte	Analytical Method[a]	Target Reporting Limit[a]
Conventionals and Physical Tests		
Total solids (%)	SM 2540B	0.1
Total organic carbon (%)	Plumb, 1981	0.1
Grain size (%)	PSEP	0.1
PAHs (µg/kg)		
1-Methylnaphthalene	8270D/SIM	5.0/20
2-Methylnaphthalene	8270D/SIM	5.0/20
Acenaphthene	8270D/SIM	5.0/20
Acenaphthylene	8270D/SIM	5.0/20
Anthracene	8270D/SIM	5.0/20
Benzo(a)anthracene	8270D/SIM	5.0/20
Benzo(a)pyrene	8270D/SIM	5.0/20
Benzo(b+j+k)fluoranthenes	8270D/SIM	5.0/20
Benzo(g,h,i)perylene	8270D/SIM	5.0/20
Benzo(k)fluoranthene	8270D/SIM	5.0/20
Chrysene	8270D/SIM	5.0/20
Dibenz(a,h)anthracene	8270D/SIM	5.0/20
Fluoranthene	8270D/SIM	5.0/20
Fluorene	8270D/SIM	5.0/20
Indeno(1,2,3-cd)pyrene	8270D/SIM	5.0/20
Naphthalene	8270D/SIM	5.0/20
Phenanthrene	8270D/SIM	5.0/20
Perylene	8270D/SIM	5.0
Pyrene	8270D/SIM	5.0/20

Notes:

[a] Reporting limits may vary based on sample size, moisture content, target analyte concentrations, and matrix interference

NA - not applicable to this analyte

PAH - polycyclic aromatic hydrocarbon

Table B-7
Surface Water Analyte List, Analytical Methods, and Reporting Limits

Analyte	Analytical Method	Target Reporting Limit[a]
Field Measurements		
Salinity	N/A	N/A
Conductivity	N/A	N/A
Temperature	N/A	N/A
pH	N/A	N/A
Dissolved oxygen	N/A	N/A
Conventionals (mg/L)		
TSS	SM 2540D	1.0
Total organic carbon	9060 Mod	1.5
Dissolved organic carbon	9060 Mod	1.5
Total cyanide	SM 4500-CN	0.005
WAD cyanide	SM 4500-CN I	0.005
PAHs (µg/L)		
1-Methylnaphthalene	8270D/SIM	0.1
2-Methylnaphthalene	8270D/SIM	0.1
Acenaphthene	8270D/SIM	0.1
Acenaphthylene	8270D/SIM	0.1
Anthracene	8270D/SIM	0.1
Benzo(a)anthracene	8270D/SIM	0.1
Benzo(a)pyrene	8270D/SIM	0.1
Benzo(b)fluoranthene	8270D/SIM	0.1
Benzo(g,h,i)perylene	8270D/SIM	0.1
Benzo(k)fluoranthene	8270D/SIM	0.1
Chrysene	8270D/SIM	0.1
Dibenz(a,h)anthracene	8270D/SIM	0.1
Fluoranthene	8270D/SIM	0.1
Fluorene	8270D/SIM	0.1
Indeno(1,2,3-cd)pyrene	8270D/SIM	0.1
Naphthalene	8270D/SIM	0.1
Phenanthrene	8270D/SIM	0.1
Perylene	8270D/SIM	0.1
Pyrene	8270D/SIM	0.1

Notes:

[a] Reporting limits may vary based on sample size, target analyte concentrations, and matrix interference

PAH - polycyclic aromatic hydrocarbon

TSS - total suspended solids

Table B-8
Porewater Analyte List, Analytical Methods, and Reporting Limits

Analyte	Analytical Method	Target Reporting Limit[a]
PAHs (ng/L)		
1-Methylnaphthalene	8270D/SIM	4.0
2-Methylnaphthalene	8270D/SIM	4.0
Acenaphthene	8270D/SIM	4.0
Acenaphthylene	8270D/SIM	4.0
Anthracene	8270D/SIM	4.0
Benzo(a)anthracene	8270D/SIM	4.0
Benzo(a)pyrene	8270D/SIM	4.0
Benzo(e)pyrene	8270D/SIM	4.0
Benzo(b+j+k)fluoranthenes	8270D/SIM	4.0
Benzo(g,h,i)perylene	8270D/SIM	4.0
Chrysene	8270D/SIM	4.0
Dibenz(a,h)anthracene	8270D/SIM	4.0
Fluoranthene	8270D/SIM	4.0
Fluorene	8270D/SIM	4.0
Indeno(1,2,3-cd)pyrene	8270D/SIM	4.0
Naphthalene	8270D/SIM	4.0
Phenanthrene	8270D/SIM	4.0
Perylene	8270D/SIM	4.0
Pyrene	8270D/SIM	4.0

Notes:

[a] Reporting limits are 0.006 to 4 ng/L depending on hydrophobicity of the compounds.

PAH - polycyclic aromatic hydrocarbon

Table B-9
Field and Laboratory Quality Assurance/Quality Control Sample Analysis Summary

Analysis Type	Field Duplicate	Field/Equipment Blank	Initial Calibration	Ongoing Calibration	Matrix Duplicates	Matrix Spikes	SRM or LCS	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes
TSS/TS/Grain size	1 per 20 samples	NA	Each batch[a]	NA	1 per 20 samples	NA	NA	NA	NA	NA
TOC/DOC	1 per 20 samples	NA	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	1 per 20 samples	NA
Total/WAD Cyanide	1 per 20 samples	1 per sampling event (total only)	Daily or each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	1 per 20 samples	NA
Metals	1 per 20 samples	1 per sampling event	Daily	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	NA	1 per 20 samples	NA
VOCs/PAHs/ SVOCs	1 per 20 samples	1 per sampling event	As needed[b]	Every 12 hours	NA	1 per 20 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample
PCDD/PCDF Congeners	1 per 20 samples	1 per sampling event	As needed[b]	Every 12 hours	NA	NA[c]	1 per 20 samples	NA[c]	1 per 20 samples	Every sample

Notes:

[a] Calibration and certification of drying ovens and weighing scales are conducted bi-annually

b Initial calibrations are considered valid until the continuing calibration no longer meets method specifications. At that point, a new initial calibration is analyzed.

[c] Labeled standards are added to each sample in isotope-dilution analyses as required by the method.

DOC - dissolved organic carbon

LCS – laboratory control sample

NA - not applicable

PAHs - polycyclic aromatic hydrocarbons

PCDD/PCDF - polychlorinated dibenzo-p-dioxins/ polychlorinated dibenzofurans

SRM – standard reference material

SVOCs - semivolatile organic compounds

TOC - total organic carbon

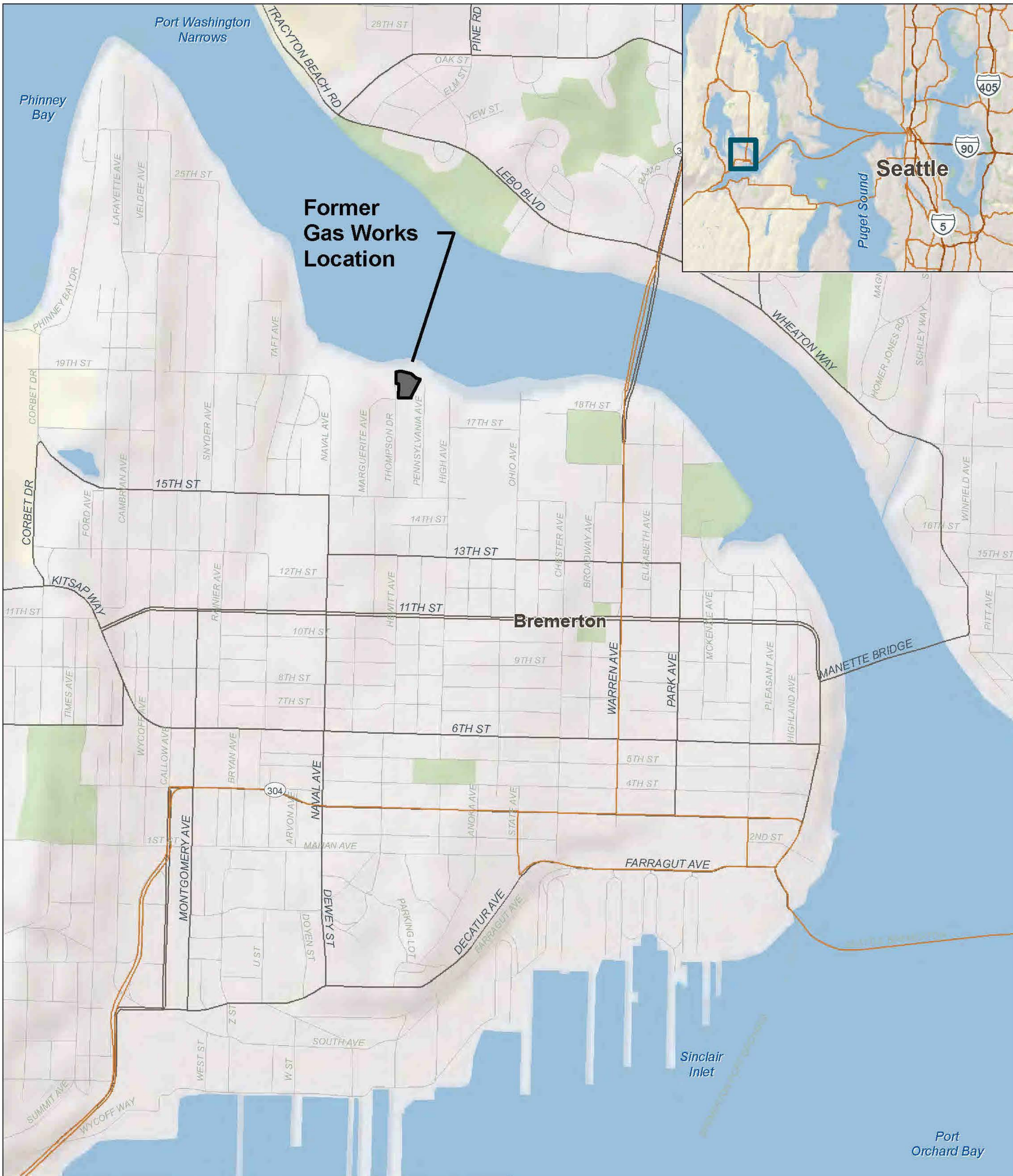
TS - total solids

TSS - total suspended solids

VOCs - volatile organic compounds

WAD - weak acid dissociable

FIGURES



AQ GIS Path: Q:\Jobs\100719-01 Bremerton MGP\Maps\2014 12\Vicinity Map.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 1/13/2015 || User: ckiblinger || Print Date: 1/28/2015

N

0 750 1,500
Feet

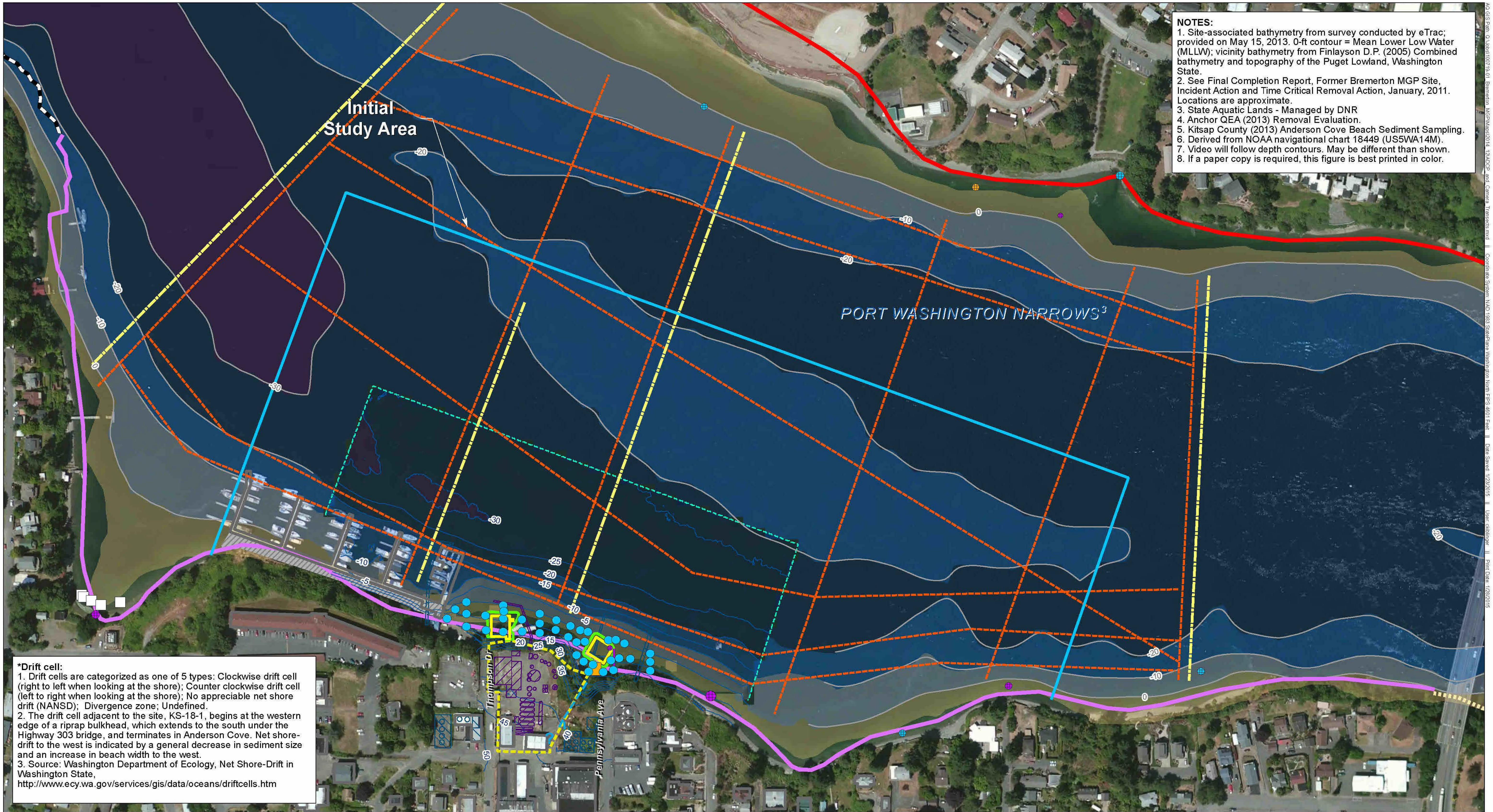
1:18,000

NOTE:
If a paper copy is required, this figure is best printed in color.

Former Gas Works Location and Vicinity
Draft Marine Sampling and Quality Assurance Project Plan
Bremerton Gas Works
Bremerton, Washington

Aspect CONSULTING | ANCHOR QEA | FIRM: ANCHOR QEA
DRAWN BY: ckiblinger | FIGURE NO. **B-1**

DNR-00050168



NOTES:

1. Site-associated bathymetry from survey conducted by eTrac; provided on May 15, 2013. 0-ft contour = Mean Lower Low Water (MLLW); vicinity bathymetry from Finlayson D.P. (2005) Combined bathymetry and topography of the Puget Lowland, Washington State.
2. See Final Completion Report, Former Bremerton MGP Site, Incident Action and Time Critical Removal Action, January, 2011. Locations are approximate.
3. State Aquatic Lands - Managed by DNR
4. Anchor QEA (2013) Removal Evaluation.
5. Kitsap County (2013) Anderson Cove Beach Sediment Sampling.
6. Derived from NOAA navigational chart 18449 (US5WA14M).
7. Video will follow depth contours. May be different than shown.
8. If a paper copy is required, this figure is best printed in color.

***Drift cell:**

1. Drift cells are categorized as one of 5 types: Clockwise drift cell (right to left when looking at the shore); Counter clockwise drift cell (left to right when looking at the shore); No appreciable net shore drift (NANSD); Divergence zone; Undefined.
2. The drift cell adjacent to the site, KS-18-1, begins at the western edge of a riprap bulkhead, which extends to the south under the Highway 303 bridge, and terminates in Anderson Cove. Net shore-drift to the west is indicated by a general decrease in sediment size and an increase in beach width to the west.
3. Source: Washington Department of Ecology, Net Shore-Drift in Washington State, http://www.ecy.wa.gov/services/gis/data/oceans/driftcells.htm

Removal Evaluation Sample Locations[4]
Initial Study Area
Approximate Riprap Area
ADCP
Towed Camera[7]

Surface Sediment Data Source
Anchor QEA[4]
Kitsap County[5]
Historical Structures Associated with the Gas Works
Historical Structures Not Associated with the Gas Works
Existing Buildings
Former Gas Works Location

Drift Cells*
Undefined
Divergent zone
Transport zone (left to right)
Transport zone (right to left)
No appreciable drift

2010 TCRA/IA Pipe Plug Location[2]
Cover of Existing Organoclay Mat (10-inch minus rock)[2]
Extent of Existing Organoclay Mat[2]
Assumed City of Bremerton 12-inch Storm Water Pipe Configuration
Bathymetry/Topography Contours (MLLW ft)[1]
Site-associated Bathymetry Extent

Outfall Size (inches)
8 - 12
13 - 24
25 - 36
37 - 48
Outfall Type
Combined Storm Drain/CSO
CSO Outfall
Storm Drain

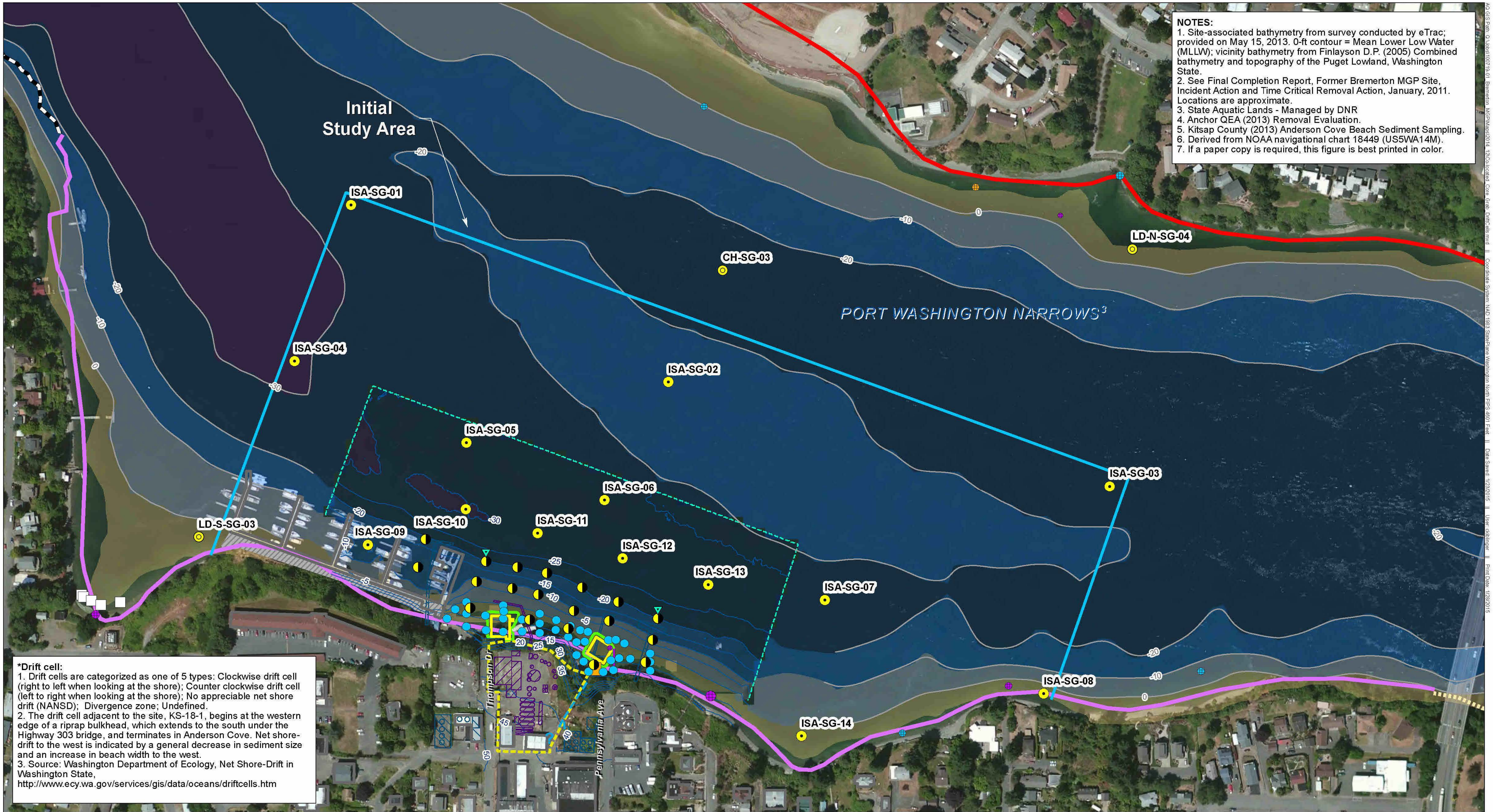
Reported Bathymetry (MLLW ft)[1]
10 to 0
0 to -10
-10 to -20
-20 to -30
Below -30
10-foot Contours[1]

0 125 250
Feet
1:3,000

Video and Tidal Current Transect Locations

Draft Marine Sampling and Quality Assurance Project Plan
Bremerton Gas Works
Bremerton, Washington

Aspect CONSULTING | ANCHOR QEA | FIRM: ANCHOR QEA | DRAWN BY: ckiblinger | FIGURE NO. **B-2**



Surface Sediment Grab	Surface Sediment Data Source	Drift Cells*	2010 TCRA/IA Pipe Plug Location[2]
Far Field Surface Grab	Anchor QEA[4]	Undefined	Cover of Existing Organoclay Mat (10-inch minus rock)[2]
Subsurface Core and Surface Grab	Kitsap County[5]	Divergent zone	Extent of Existing Organoclay Mat[2]
Surface Water Locations	Historical Structures Associated with the Gas Works	Transport zone (left to right)	Assumed City of Bremerton 12-inch Storm Water Pipe Configuration
Removal Evaluation Sample Locations[4]	Historical Structures Not Associated with the Gas Works	Transport zone (right to left)	Bathymetry/Topography Contours (MLLW ft)[1]
Initial Study Area	Existing Buildings	No appreciable drift	Site-associated Bathymetry Extent
Approximate Riprap Area	Former Gas Works Location		

Outfall Size (inches)	Reported Bathymetry (MLLW ft)[1]
8 - 12	10 to 0
13 - 24	0 to -10
25 - 36	-10 to -20
37 - 48	-20 to -30
Outfall Type	Below -30
Combined Storm Drain/CSO	10-foot Contours[1]
CSO Outfall	
Storm Drain	

N

0 125 250
Feet
1:3,000

Initial Study Area Sampling Locations

Draft Marine Sampling and Quality Assurance Project Plan
Bremerton Gas Works
Bremerton, Washington

Aspect CONSULTING | ANCHOR QEA | FIRM: ANCHOR QEA | DRAWN BY: ckiblinger | FIGURE NO. B-3

NOTES:
1. Finlayson D.P. (2005) Combined bathymetry and topography of the Puget Lowland, Washington State.
2. State Aquatic Lands - Managed by DNR
3. See Figure 2 for locations of co-located grab and core sampling within this area.
4. Anchor QEA (2013) Removal Evaluation.
5. Washington Department of Ecology Environmental Information Management system online database (queried January 2014).
6. Kitsap County (2013) Anderson Cove Beach Sediment Sampling.
7. Derived from NOAA navigational chart 18449 (US5WA14M).
8. If a paper copy is required, this figure is best printed in color.

*Drift cell:
1. Drift cells are categorized as one of 5 types: Clockwise drift cell (right to left when looking at the shore); Counter clockwise drift cell (left to right when looking at the shore); No appreciable net shore drift (NANSD); Divergence zone; Undefined.
2. The drift cell adjacent to the site, KS-18-1, begins at the western edge of a riprap bulkhead, which extends to the south under the Highway 303 bridge, and terminates in Anderson Cove. Net shore-drift to the west is indicated by a general decrease in sediment size and an increase in beach width to the west.
3. Source: Washington Department of Ecology, Net Shore-Drift in Washington State, http://www.ecy.wa.gov/services/gis/data/oceans/driftcells.htm

- ISA Surface Locations
- Port Washington Narrows Surface Sediment Locations
- Ex situ Porewater Testing
- Subsurface Core and Surface Grab
- Surface Water Locations
- Removal Evaluation Sample Locations[4]
- Initial Study Area[3]

Surface Sediment Data Source
- Anchor QEA[4]
- EIM[5]
- Kitsap County[6]

Outfall Size (inches)
- 8 - 12
- 13 - 24
- 25 - 36
- 37 - 48
- 49 - 60
- 61 - 72
- 73 - 84

Outfall Type
- Combined Storm Drain/CSO Outfall
- CSO Outfall
- Storm Drain

Drift Cells*
- Undefined
- Divergent zone
- Transport zone (left to right)
- Transport zone (right to left)
- No appreciable drift

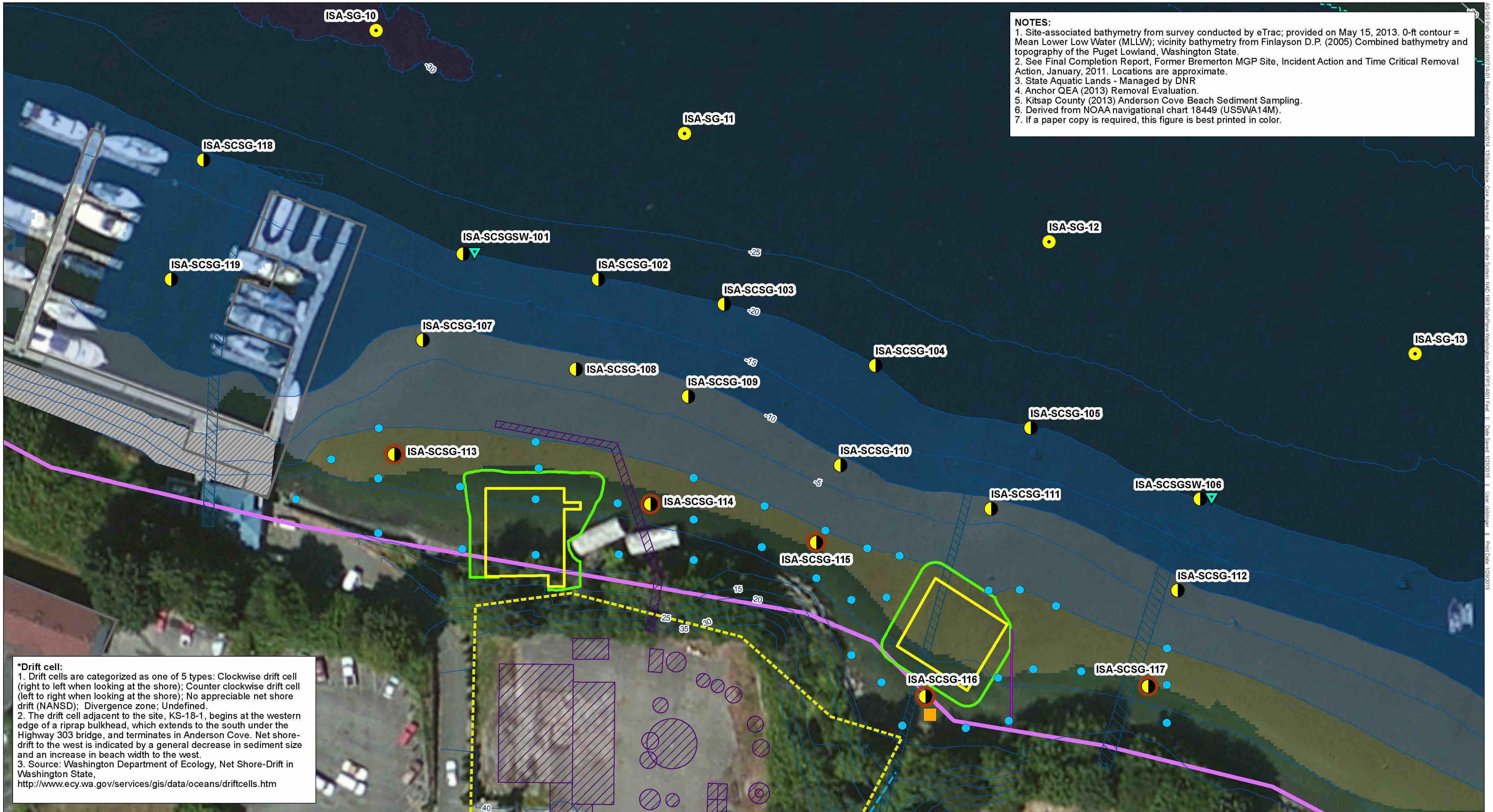
Reported Bathymetry (MLLW ft)[1]
- 10 to 0
- 0 to -10
- -10 to -20
- -20 to -30
- Below -30
- 10-foot Contours[1]

0 400 800
Feet
1:10,000

Port Washington Narrows Sampling Locations

Draft RI/FS Work Plan
Bremerton Gas Works
Bremerton, Washington

Aspect CONSULTING | ANCHOR QEA | FIRM: ANCHOR QEA | DRAWN BY: ckiblinger | FIGURE NO. B-4



NOTES:
1. Site-associated bathymetry from survey conducted by eTrac; provided on May 15, 2013. 0-ft contour = Mean Lower Low Water (MLLW); vicinity bathymetry from Finlayson D.P. (2005) Combined bathymetry and topography of the Puget Lowland, Washington State.
2. See Final Completion Report, Former Bremerton MGP Site, Incident Action and Time Critical Removal Action, January, 2011. Locations are approximate.
3. State Aquatic Lands - Managed by DNR
4. Anchor QEA (2013) Removal Evaluation.
5. Kitsap County (2013) Anderson Cove Beach Sediment Sampling.
6. Derived from NOAA navigational chart 18449 (US5WA14M).
7. If a paper copy is required, this figure is best printed in color.

***Drift cell:**
1. Drift cells are categorized as one of 5 types: Clockwise drift cell (right to left when looking at the shore); Counter clockwise drift cell (left to right when looking at the shore); No appreciable net shore drift (NANSD); Divergence zone; Undefined.
2. The drift cell adjacent to the site, KS-18-1, begins at the western edge of a riprap bulkhead, which extends to the south under the Highway 303 bridge, and terminates in Anderson Cove. Net shore-drift to the west is indicated by a general decrease in sediment size and an increase in beach width to the west.
3. Source: Washington Department of Ecology, Net Shore-Drift in Washington State, http://www.ecy.wa.gov/services/gis/data/oceans/driftcells.htm

Surface Sediment Grab
Far Field Surface Grab
Subsurface Core and Surface Grab
Supplemental Analysis and ex situ Porewater Testing
Surface Water Locations
Removal Evaluation Sample Locations[4]
Initial Study Area

Surface Sediment Data Source
Anchor QEA[4]
Kitsap County[5]

Historical Structures Associated with the Gas Works
Historical Structures Not Associated with the Gas Works
Existing Buildings
Former Gas Works Location

2010 TCRA/IA Pipe Plug Location[2]
Cover of Existing Organoclay Mat (10-inch minus rock)[2]
Extent of Existing Organoclay Mat[2]
Assumed City of Bremerton 12-inch Storm Water Pipe Configuration
Approximate Riprap Area

Bathymetry/Topography Contours (MLLW ft)[1]
Site-associated Bathymetry Extent
10-foot Contours[1]

Drift Cells*
Transport zone (left to right)

N

0 25 50
Feet
1:700

Subsurface Core Sampling Locations

Draft Marine Sampling and Quality Assurance Project Plan
Bremerton Gas Works
Bremerton, Washington

Aspect CONSULTING
ANCHOR QEA

FIRM: ANCHOR QEA
DRAWN BY: ckiblinger

FIGURE NO.
B-5

Appendix C

Historical Records

- 1942 Western Gas Company Investigation
- 1997 Svari Simonson Deposition Transcript
- Interview Notes – Clapp (1997), Simonsen (1997), and West (1998)
- 2014 Ralph Judd Interview Summary
- Undated drawing of Former Bremerton Gas Plant
- 1947 Sanborn Map
- 1968 Sanborn Map
- 1946 Aerial Photograph
- 1956 Aerial Photograph
- 1961 Aerial Photograph
- 1965 Aerial Photograph
- 1971 Aerial Photograph

An Investigation

of The Western Gas Company of Washington

Bremerton, Washington

pertaining to

Fire-Hazard at the Gas Plant

Disposal of By-Products

Proposed Piping Ordinance

by

Sybren R. Tymstra

Registered Engineer

Associate Professor of Mechanical Engineering

University of Washington

ML

The Honorable H. A. Bruenn

Mayor of the City of Bremerton

Bremerton, Washington

Dear Sir:

Attached you will find the results of the investigation requested in your letter of March 14 pertaining to (1) fire-hazard at the local plant, (2) disposal of by-products, and (3) the proposed piping ordinance. Included in the report are suggested remedial measures for the conditions which were found to exist.

No attempt has been made to examine the gas plant proper to establish whether or not it will be able to supply the demand for gas if the city of Bremerton, its surrounding territory, and the Navy Yard continue to grow at the present rate. I shall be ready to make a further report at any time you express the wish for such additional investigation.

Respectfully submitted,

S R Tymstra

S. R. Tymstra

SYBREN R. TYMSTRA · STATE OF WASHINGTON · REGISTERED PROFESSIONAL ENGINEER

25 Ap 42 for Engineering Collection

AN INVESTIGATION OF THE WESTERN GAS COMPANY OF WASHINGTON

The Western Gas Company of Washington, located at Bremerton, Washington, was inspected on March 25 to establish whether or not it constituted a fire hazard and what disposal may be made of those by-products which cannot be sold. Moreover, the request made by the City Council to scrutinize the proposed ordinance for "The Installation, Maintenance, and Use of Piping and Fittings for City Gas" in customers' premises, was complied with.

The inspection trip to the gas plant was conducted by the Fire Chief, the Gas Plant Manager, and the writer.

INTRODUCTION

The plant itself is in a condition which can best be described as "better than average". About 700,000 cubic feet of carbureted water-gas of 500 British thermal units heating value is made per day, and leaves the plant at a pressure of 40 pounds per square inch. This output seems to be close to the capacity of the plant. Any extensive growth of Bremerton, its surrounding territory, or the Navy Yard may, before long, demand increased gas-manufacturing capacity.

FIRE HAZARD

For the removal of tar from the gas, it is passed through apparatus filled with wood chips. In the past, excelsior was used for this purpose. While removing the tar from the gas, this material itself becomes covered with it and must finally be disposed of. Saturation occurs to a lesser extent with the iron-oxide-covered chips in other apparatus used for the removal of sulfur compounds from the gas.

The tar-laden wood chips and also the previously used tar-covered excelsior, as well as soot from the water-gas machines, is dumped at the edge of the plant near the oil-storage tanks in order to fill a gully. Tests conducted at the plant showed that (1) the soot will burn moderately, just about like fine coal; (2) the wood chips will burn somewhat better, just like kindling; and (3) the tar-soaked excelsior, when lighted, will flare up--as was to be expected. This condition, and particularly the proximity of the dump to the oil-storage tanks, constitutes a distinct fire hazard; especially so as no adequate fire protection is available in this section of the city.

DISPOSAL OF BY-PRODUCTS

The by-products of the gas plant consist of water-gas tar, a tar emulsion (combination of tar and water), and its effluent liquor, which is mostly water mixed with a little tar and oil.

The tar proper is sold to the Barrett Company and is shipped to Canada. The effluent liquor is lately being cooled to remove its condensable vapors and is sent to the bay through a drain pipe. The tar emulsion is dumped in shallow pits dug at random in the ground.

Tests conducted at the plant show that the emulsion carries so much water that it will not burn in its present state, not even when exposed to a bonfire. Therefore, it is decidedly not a fire hazard.

The pits or pools containing this emulsion are not guarded or fenced in, and therefore constitute a safety hazard for children playing around them and for others cutting across the vacant property on which these pits are located.

THE PIPING ORDINANCE

The proposed piping ordinance has been carefully examined. It is found to be an excellent one as a whole, but experience with it has pointed to some discrepancies, inaccuracies, and even some impossibilities.

RECOMMENDATIONS

FIRE HAZARD

a. A fire plug or hydrant should be installed in the street in front of the gas plant, and should be connected to the water main located there. This hydrant will also give fire protection to the houses across the street.

b. The tar-laden excelsior which is exposed to sight or easily accessible should be raked out of the dump, carried to a safe place, and burned.

c. The tar-covered wood chips, when dumped, should be evenly spread or raked out and be covered with a layer of the soot. This, in turn, should be covered with a layer of the ashes and cinders now dumped elsewhere. Care should be taken to have the ashes and cinders thoroughly quenched.

These suggestions will eliminate the fire hazard and change it to a safe dump.

Of course, the chips could also be burned if convenient, but this is not considered necessary if they are covered as suggested.

THE DISPOSAL OF BY-PRODUCTS

a. The disposal of effluent into the bay should be tolerated as long as it does not constitute too great a nuisance. Otherwise, it should be passed through a coke filter, which will absorb some of its objectionable constituents. The coke itself when saturated with these can be used up in the water-gas machines. However, the new cooler may have sufficiently cleared up this situation.

b. The emulsion could be used as road material, either after being treated, or as it is. In either case, the amount involved is too small to warrant extensive preparations. Therefore, the gas company should be allowed to dispose of this at its own discretion, in either of two ways: (1) to cover the unpaved road to its own plant with a very thin layer, if the city will immediately cover it with sand; (2) to continue to dump it in shallow pits, but to put a simple and inexpensive fence around these, and ultimately to cover them with dirt. The fence will safeguard the pits sufficiently so as to remove all danger.

THE PIPING ORDINANCE

The following changes are recommended in the proposed piping ordinance:

Section

3-b Fourth line: change the word "never" to "not".

3-f Add "and an extension light complete with guard".

4-a Add "such craftsman shall also install the electric wiring between the standard electric system and any step-down transformer (similar to a doorbell transformer) furnishing a low voltage current for any gas-regulating device."

6-a & b b should come first and be called a; a should come second and be called b.

8 Do not add the words "30 lbs air pressure", inserted in red in the code. Section 4 of the appendix covers the details of testing.

11 Reference is made in a and b to "a gas fitter not in the employ of the gas company". In c and d reference is made to "a gas fitter", but "a gas fitter not in the employ of the gas company" is meant.

12-c Fourth line: delete "or into the combustion...burning flame".

14-a Ninth line: change the word "best" to "standard".

14-d Fourth line: change the word "perfect" to "good"; delete "in that building".

14-e Change "all bends" to "all sharp bends".

17 Change to read: "Piping to be Sloped.

All piping shall be sloped, preferably not less than ¼ inch in 15 feet to prevent traps. The entire piping system should drain back towards the meter, unless the structure is so framed as to prevent this; but this rule does not permit violation of Rule 16. In the latter case, proper means must be provided to take care of the condensate."

Whether or not the appendix is intended to be part of the ordinance is problematical. If it is to be included, then exception is taken to section 9. This section is called "Inspection of New Piping", but it concerns itself greatly with the testing of the piping by the proper administrative authority. No one is more interested in a tight piping system than the gas company, and it should do the testing without further supervision. Otherwise, the testing equipment will have to remain connected until a city inspector gets on the job. Past experience with a similar code has shown that this may take days. In the meantime the customer is deprived of the use of gas, and the gas company's testing apparatus is tied up or must be reinstalled.

VIDEO DEPOSITION OF SVARI SIMONSON
(Written transcript of videotape/audiotape)
November 24, 1997

Participants: Tom Lindley, Miller Nash ("TL")
Svari Simonson, Former Employee of Cascade ("SS")

[Note: ** = indicates word or phrase within asterisks is unclear]
[** = totally indecipherable word or phrase]**

TL: Good afternoon, this is Tom Lindley. I'm an attorney with Miller Nash. Miller Nash is legal counsel for Cascade Natural Gas. It is Monday, November 24, 1997; a few minutes before 1:00 in the afternoon. I'm here to obtain some information relating to the Bremerton, Washington manufactured gas plant site. This matter came to the attention of Cascade Natural Gas and to my attention based on a letter from William Sesko -- S-E-S-K-O -- that was sent by Mr. Sesko's attorney to Cascade Natural Gas talking about the old Bremerton gas works, and I have marked that -- just for purposes of the record to go along with the video -- as Simonson Video Exhibit No. 1. I'm not going to go through it and we aren't going to use it, but the purpose of referring to Simonson Video Exhibit No. 1 is to point out that it is a demand from Mr. Sesko through his attorney to Cascade and that it attaches to it as its third page, a map that the letter describes as a 1928 Sanborn map. Now, this 1928 Sanborn map is one that I'm going to be using throughout this talk to try to gain additional information about what happened at this facility. We invited Mr. Sesko or his attorney to be present today, as we were attempting to get more information. We've received an indication that they have chosen not to attend. We again offered them another opportunity and they have not responded.

We're here today with a former employee of Cascade Natural Gas, and that is Mr. Simonson, and I'm going to ask Mr. Simonson to identify himself for the camera and for me.

SS: Oh, I'm Svari Simonson.

TL: And Mr. Simonson, when were you born?

SS: 1919; 16th of August.

TL: And where were you born?

SS: In Oslo, Norway.

TL: And you came to the United States shortly after World War II?

SS: Yes.

TL: Now, after you came to the United States, you held several different professional positions or occupations. One was the manager of an oyster shell mill?

SS: Right.

TL: After leaving the oyster shell mill, did you join with a gas company?

SS: Yes.

TL: And what was that gas company?

SS: Western Gas; located on Thompson Drive.

TL: And that's Thompson Drive in Bremerton, Washington?

SS: Right.

TL: And about what year was that?

SS: 1953.

TL: And did that -- what was at that plant or that site?

SS: It was a manufacturing gas plant; manufacturing gas for public use.

TL: And how long did you stay at that plant site? How long did you keep working at that plant site?

SS: You mean before we got the propane **air** in?

TL: At least initially, yes.

SS: Around roughly two years.

TL: Okay; were you at the sight until it ultimately closed?

SS: Yes.

TL: Did the site ever transfer from Western Gas to another gas company?

SS: Yeah; transferred to Cascade Natural Gas.

TL: Did you continue to work with Cascade Natural Gas?

SS: Yes, I did.

TL: But not at that plant site.

SS: No.

TL: After it was converted to propane.

SS: Yeah; then we worked out of the office -- downtown Bremerton.

TL: Okay; we'll talk about that plant site in some -- at some length in a moment or so. What positions did you hold at the Bremerton manufactured gas plant site?

SS: At the time there was shut down?

TL: What did you start as?

SS: I started as a gas maker's helper.

TL: Um-hmm.

SS: And ended up as a gas maker.

TL: Okay; and what does a gas maker's helper do?

SS: You keep the place op -- clean, neat -- and you also haul in briquettes to be used in the generator to generate the heat to what we call crack down the oil to make gas out of the oil.

TL: And what did the gas ma -- what did you do as the gas maker at that facility?

SS: Then I was making the gas.

TL: Okay; let's talk a moment about how you manufacture gas. Many people these days are accustomed to turning a switch.

SS: Um-hmm.

TL: And the heater comes on and the gas comes through pipes.

SS: Um-hmm.

TL: We're talking now about something you were doing in the early 1950's. How did you make gas?

SS: Well, first we had a generator that was heated up to -- I'm not sure -- say 11 -- 1200 degrees and then the oil come in -- into that hot wall and evaporated. Then it went from there into a scrubber where the gas goes through a tank where you have wooden slots and **water** so the gas is kind of washed out. Then it goes from there and into holder and from the holder it goes into a purification and from there it goes into the holder that supplies the gas for the city. Is that about --?

TL: That's a good summary. In terms of the way you heated it, I believe you used the word "briquettes".

SS: Yes.

TL: Were they a fuel for a heater of some sort?

SS: Right; they were used in the generator for heat.

TL: And you said that oil would go in and be evaporated.

SS: Right.

TL: What type of oil was that?

SS: Diesel oil.

TL: And the diesel oil would then go through -- if I understood correctly -- you said after it evaporated it would go through some sort of scrubber?

SS: Yes.

TL: And can you tell me a little more about the scrubber?

SS: The scrubber is a tank with wooden boards and water sprinkling over the wooden slots and the gas goes through there and that's what the scrubber did before it went into the purification.

TL: And what happened in the purification section?

SS: Well, that takes all the impurities out of the gas and takes some of the odor out of it and that's about only thing it is.

TL: And then the gas would go into storage tanks?

SS: Yes.

TL: And from the storage tanks it'd be pumped to the people who were going to use the gas.

SS: Yeah, the -- we had the -- we had two compressors that was pumping into the storage tanks and they were kept up to -- oh, I can't remember for sure, but around 80-85 pound of pressure on those storage tanks. So when we shut the plant down in the evening, then the city had plenty of gas coming out of the storage, so they were drawing out of the storage tanks at all times.

TL: So you made gas only part of the day, but you'd store what you made and then that stored portion would be used in the evenings?

SS: Yes and through the day also.

TL: With -- you mentioned that at some point the plant was closed down as a manufacturing plant; is that correct?

SS: Yes, yes.

TL: And that was approximately 1955 or '56?

SS: Yeah, around that time; yes.

TL: Can you describe what happened when that plant was closed down as a manufacturing plant?

SS: Well, everything -- the machines were shut down and the only thing we used as a compressor, we had automatic -- installed automatic propane air plant and the compressor then pumped the gas into the old storage tank that was previously used for manufactured gas; so used the same tanks.

TL: So you didn't need the briquettes anymore.

SS: No.

TL: And you didn't need the diesel oil anymore.

SS: Right.

TL: Let's talk about -- now we've talked about the gas and how it was made.

SS: Um-hmm.

TL: And where it went, when you make gas and you evaporate oil you get some sort of by-products don't you? Or waste?

SS: Right; we had bug juice -- and there was very little of it and then we had creosote. And the creosote was hauled out to -- on the barge from the dock we had. We pumped the creosote down to the dock and they hauled it out of there on barges.

TL: Now some people might call creosote a waste since it's generated as a byproduct of the process.

SS: It's a byproduct that's a good selling product that people in **** bought it. They use it to all kinds of things. They can even use it to paint with it so iron won't rust. What they did over in Seattle or wherever they got the big tanks. I don't know.

TL: But it was a valuable byproduct that you were able to sell.

SS: Oh, yes.

TL: And you said you loaded it off the site by the -- to a barge?

SS: Yes.

TL: You also mentioned bug juice.

SS: Um-hmm.

TL: Can you tell us a little bit about that?

SS: Well, there isn't much I can tell you about that because we didn't have much of it, but we had used a sprinkling can and sprayed on the weeds and the blackberry -- those going along the fence next to the road out there on Thompson Drive. So we kept that neat and clean looking.

TL: Did you spray the bug juice anywhere else?

SS: No.

TL: Did you ever dump it anywhere or ever hear of it being dumped?

SS: No; nuh-huh.

TL: Did you or did any of your colleagues use the bug juice for anything?

SS: Well, they told me they had even used it in their cars during the war.

TL: To go with their gasoline?

SS: Yeah; and they said -- one fellow was telling me that stuff is so hot even burned the valves on his engine, so they could prove that it worked all right.

TL: So this particular byproduct that you're calling bug juice --

SS: Um-hmm.

TL: -- was very flammable?

SS: Yes, yes.

TL: And did you ever use it in your car?

SS: No.

TL: Okay; you've described the property in Bremerton and said it was near Thompson. I'm going to pull up a map of the area and we'll ask you to talk for just a little bit about the map. This is an enlargement of the map that I just showed from Mr. Sesko's attorney's letter, and it's the same map; just a larger size. Let's see if I can fold it flat here and hold it out. And then I'm going to ask you some things about the map.

SS: Um-hmm.

TL: Now, there's a reference -- this is a 19 -- is designated as a 1928 map. You indicated you started working there in the 1950's.

SS: Um-hmm.

TL: 1950 --

SS: Three.

TL: -- three; is this Western Gas Company site located where the Western Gas Company site was that you worked at?

SS: Right; correct.

TL: That's between roughly -- somewhere between Pennsylvania Avenue and Thompson Avenue?

SS: That's correct.

TL: And it shows the Port of Washington Narrows -- or Port Washington Narrows.

SS: Um-hmm.

TL: That's a waterway adjacent to that; isn't it?

SS: Yes.

TL: Now, was the lan -- was the land itself hilly or generally flat or how was it in that area?

SS: Where the plant was located it was pretty flat in there.

TL: Okay.

SS: Right in --

TL: And what was the bank going to the water like?

SS: It was very steep. Nobody could even walk down that.

TL: Okay.

SS: It was really steep. They had some -- in fact, they had build steps to go down to the dock **bay** because nobody could walk it.

TL: And you've mentioned the dock; I'll ask you: did Western Gas or Cascade Gas have a dock at this site?

SS: Yes, we had one down below here.

TL: And that dock would be sort of off the area that on this map is labeled "winch" and be about this part of the property?

SS: Yes; it be close to that; yes.

TL: We'll have a larger version of this whole area in a moment, but what I'd like to do is to talk about the rest of the area now with some of the neighbors on the map.

SS: Um-hmm.

TL: This map shows a Richfield Oil Company to be -- north is at this side of the map. Do you see that? Is this your recollection as well?

SS: North -- the be --

TL: So that north --

SS: North -- yeah; so the be west of Thompson Drive; right?

TL: I'll have to -- I have to ask you that but --

SS: Yeah.

TL: Did Thompson Drive run north/south?

SS: Yes.

TL: Okay.

SS: So then this would be west and here was a hill from Thompson Drive and north there was a hill going over there.

TL: And Richfield Oil Company was up that hill?

SS: Up on the hill; yes.

TL: And it -- it was Richfield Oil then. Thompson Drive runs north/south.

SS: Um-hmm.

TL: Richfield Oil Company would be to the west and Richfield was up a slight or a steep hill?

SS: Oh, a slight hill.

TL: Slight hill.

SS: Yeah.

TL: Okay; and that was still operating when you were there in the 1950's.

SS: Right.

TL: Okay. Now, just south of the Western Gas Company site is an area identified as "lent's" -- L-E-N-T'S.

SS: Yes.

TL: Do you remember the Lent's was there when you were there in the 1950's?

SS: Yeah; they had that property at that time; yeah.

TL: Now, immediately to the east of the Western Gas Company site is what appears to be a drawing of a number of gasoline or diesel or fuel tanks of some sort. Do you remember whether those tanks were there in the 1950's?

SS: Yes, they were there.

TL: Do you remember who owned them at that time?

SS: It was Lent's because I see Lent's had the big trucks out there.

TL: Okay; and for -- just to make this -- this is north on this map; this is south on the map. Thompson runs north to south and Lent's would be then immediately south of your plant site.

SS: Yes.

TL: And these are the tanks that you were talking about?

SS: That's correct; yeah.

TL: Now, the map has a big open area to the north of Richfield Oil. Do you remember anything being located there?

SS: Yeah, they have a yacht club down there. Let's see; the yacht club will be right down in this area.

TL: So it would be just immediately north of the Richfield Oil Company and immediately west of Thompson Avenue?

SS: Yeah, that's correct.

TL: Okay. Now, when you say a yacht club, is that a marina of some sort?

SS: Yeah, they had that marina there and they also -- I met some people lived on their boat down there, so --

TL: When was that?

SS: Was in 1954?

TL: Okay; if I may, what I'd like to do now is turn to the blow up or the enlargement of the Western Gas Company site portion of this map and to talk with you about that portion of the site.

SS: Okay.

TL: I'm gonna make one exception; my apologies.

SS: Okay.

TL: We've talked about there being -- let's see if I can hold this up -- fuel tanks in this area. Do you remember any fuel tanks over to the east of Pennsylvania Avenue?

SS: Yes; **** had big tanks up there.

TL: And you mentioned the dock --

SS: Um-hmm.

TL: -- for Western Gas which was just off this area of Western Gas.

SS: Yes.

TL: Was there another dock?

SS: Yeah; Lent's -- Lent's had a dock further up this way.

TL: And is that dock still there?

SS: That I don't know.

TL: Okay.

SS: I haven't been around that way **** couldn't tell you.

TL: Okay. Do you know whether any of the other companies in this area also used that dock?

SS: No.

TL: Okay; did Cascade or Western ever use this other dock?

SS: No.

TL: Did anyone other than Cascade or Western ever use the Cascade dock?

SS: No.

TL: Okay. Now, I'm going to hold up and then I'll put down so we can talk about it --

SS: Okay.

TL: -- the enlargement of the portion of the map that was the Western Gas Company site.

SS: Um-hmm.

TL: And this is again from that 1928 map and this is simply labeled "Simonson Video Exhibit No. 3", so it's the same map we've been about. But do you recognize this general area?

SS: Yes.

TL: And is this the area we've been talking about?

SS: Yes.

TL: Now, I'll -- the dock I believe you said would be just off of the Lent's area?

SS: That's correct; yeah.

TL: What was the dock used for again?

SS: We loaded creosote on barge down there. They -- I don't know who bought the creosote, but they come in with the barge with a big tank and we loaded the creosote down there.

TL: And did you bring things from the dock onto to the site?

SS: Yeah; we also got propane delivered. They we pumped that up to a propane tank over in here.

TL: And where did your briquettes come from?

SS: I don't know where they came from, but we got a couple of loads in on the barge and later they was hauled in with trucks.

TL: Where were the briquettes stored?

SS: They were stored right in the area behind, well, they'll be west of the building -- in the back of the building in there. That's where they stored all the briquettes.

TL: And that on this map would then be the area immediately east of Thompson Avenue?

SS: Yes.

TL: So the briquettes then would be stored right in here?

SS: Right.

TL: Okay; and you said the creosote would be pumped from a tank up in here somewhere.

SS: Um-hmm.

TL: Down to the dock?

SS: Right.

TL: And propane was pumped up to a propane tank here.

SS: Right.

TL: Okay; now, just in terms of direction -- again this is an expansion of the earlier maps, so north goes this way and that would mean that this is the same Richfield Oil site.

SS: Yes.

TL: Okay; and we talked about a fence.

SS: Um-hmm.

TL: You mentioned the fence where some bug juice was sprayed.

SS: Yes.

TL: Where was that fence on this map? Can you point it out?

SS: The fence was going -- let's see -- going from the gate and over here a little ways.

TL: Okay; was there also a fence between yourself and Lent's?

SS: Yes.

TL: Okay; was there any other fence going back this way?

SS: No.

TL: Now, this again is designated a 1928 -- can you tell me what part of this was there when you were there in the -- from 1953 to 1956?

SS: Well, this stuff in the storage tanks and everything was there. I don't recall ever seeing those tanks up there.

TL: So these what are listed as oil and gasoline tanks were not there when you came in the 1950's?

SS: No; I never seen them.

TL: And these diesel tanks -- were they there or were they gone by then?

SS: We had only one diesel tank and it was a square tank.

TL: Okay; that was -- I believe you pointed here?

SS: Right.

TL: Okay; now, this shows the big circle that it calls a gas holder.

SS: Right.

TL: Can you describe what that was?

SS: Well, when they made the gas they came out of the gas machines through the scrubber and into this -- this tank. They was floating **** by water, so when the gas got in there it just lifted this top of the tank up -- just floating in the water.

TL: So that was where the gas went when it was first coming out of being manufactured.

SS: That's right.

TL: Where did the -- and then you mentioned the gas went to scrubbers.

SS: Yes.

TL Or to a scrubber; where was that scrubber?

SS: The scrubber's located right next to that storage tank.

TL: So it's this little circle right here?

SS: Yes.

TL: Okay; now these are -- these three circles are called scrubbers here, but I believe you've used another word to describe those?

SS: Yeah; they was the **putifiers** **[purifiers?]**. We took some of the odor out of the gas and other impurities that was in the gas that was taken out by using this wooden chips and some oxide of some -- some kind. I don't know exactly what that was.

TL: So the gas would be purified in these purifiers and then would be pumped into the storage tanks?

SS: That -- yeah, that's correct.

TL: Now, that would mean that there was some sort of waste coming out of the purifiers?

SS: Yes; they was -- they were cleaned out every so often, but I never saw where the waste went, but it could've been hauled out and I wasn't at work that day or whatever.

TL: So the wood chips and so on that you've described were hauled -- they were not stored on site?

SS: No; they're hauled out.

TL: Okay; now, this 1928 drawing shows six roughly equal -- or equal tanks.

SS: Um-hmm.

TL: When you were there in the 1950's were all the tanks the same size?

SS: No; the one on the very end over here was a little smaller than the others.

TL: And what did it hold?

SS: It held creosote.

TL: Now, this is designated BLR RM. Can you tell me what this was? What this part of this building was?

SS: That's where the machines were. We had two machines, one in the north end and one in the middle of the building where we made the gas. So we had two machines and one was shut down, then we overhauled the other **** ready.

TL: Did you ever use a boiler to heat those machines?

SS: It was a generator we called it; a generator. That's where we used the briquettes to keep the temperature up.

TL: Okay.

SS: So --

TL: Now, was this -- were those machines on the ground or were they on concrete or were they on -- how -- describe the building to me if you will.

SS: Well, there's a big building and a concrete floor.

TL: And there would be a pipeline that connected that building to the -- to the gas holder?

SS: Yeah; there had to be.

TL: And what is this small building over here?

SS: That -- that is the same. That's no building there. The building goes straight over and there's no building there. What we had in there was a little shed with a 50-horse electric motor that was run the cable down to pick up the briquettes on the -- run the bucket on the cables picking up the briquettes down in the bay.

TL: There's a dotted line sort of rectangle up here. Do you know, was there something there when you came in the 1950's?

SS: No, was nothing there.

TL: Okay; now, you've indicated that the briquettes were stored here.

SS: Yes.

TL: There's also some space up here. What was this used for?

SS: Well, when I came they had the propane -- big propane truck delivered and they sold propane around town, and that truck was parked in there. There was no building there.

TL: Did anyone ever park anything else in there?

SS: Yeah, we had the fellow that bought the bus that went between Poulsbo and Bremerton and he bought that bus and made it into motor home, and he had that parked there.

TL: Now, can you describe what this area was like? Was it --

SS: Well, it was more like a gravel parking lot. That's what I would call it; and then in the back there's a steep bank that goes down and had some -- I guess that belonged to Lent's -- and there were just tiny little trees growing in there and that kind of stuff; bushes, whatever.

TL: Now, when this facility -- when this plant was converted from a manufacturing plant to a propane plant, how many tanks or what type of tanks were used to store the propane?

SS: One tank.

TL: And do you know what happened to the other tanks?

SS: Well, excuse me, the other tanks were used for storing manufactured tanks -- manufactured gas and they were then used to store the propane air we had for the city.

TL: Now, with all the gas being manufactured on site or brought on side, presumably you had some way to get it off site. You had a gas pipeline of some sort?

SS: Well, we had the distribution system in Bremerton.

TL: Can you point out where that gas line would've come out from this -- on this drawing?

SS: Yeah, it came -- came out from here, going straight down and up to Thompson.

TL: So it would come in essence from east to west onto Thompson?

SS: Um-hmm.

TL: And then it would go south on Thompson.

SS: Right.

TL: And do you know about how far down Thompson it went?

SS: Well, it went to 15th Street and then went east on 15th Street and over on High Street. It went -- it went down High Street to 13th Street and that's where you had the regulator station. That's -- for that line then went into the distribution system.

TL: Who were the biggest customers at that time?

SS: Navy Yard.

TL: Did anyone other than the Navy Yard use Cascade or Washington -- or I'm sorry -- Western Gas?

SS: Oh yes; we had quite a few. We had 500 customers -- 400 -- 500 customers.

TL: Good; and can you name some of those other customers? For example, was the city a customer?

SS: No; they're mostly private homes. We had gas downtown but I -- I couldn't -- I couldn't name them; mostly private homes.

TL: Okay.

SS: In any place -- any street, so I couldn't tell you.

TL: Now, was this pipeline that went first over to Thompson then up Thompson and underground or above ground pipe?

SS: That was in the ground.

TL: Within the ground?

SS: Yeah; in the ground.

TL: Okay; you were at this site from 1953 until it closed?

SS: Yes.

TL: And would you tell me -- can I offer you some water?

SS: Thank you.

TL: Can you tell me how the site was maintained or kept up?

SS: We always took real good care of it. In fact, we were so particular about this -- I should have told you sooner. We had briquettes that broke and turn to powder ****. We would clean that up and we had a little machine here. We used to take the stuff it cleaned up and heat it with steam and make new briquettes out of it. Everything was kept just -- just great.

TL: Were the grounds kept the same way?

SS: Yes.

TL: At -- in some manufactured gas plant sites there's talk of tar or tar pits or tar wells. Did you have any tar wells or pits or piles on site?

SS: No, we never had anything like that.

TL: Did you ever have any big spills or releases that you were -- either while you were there or that you heard of from before you were there?

SS: No, we never did; nuh-huh.

TL: Now, you mentioned changing the purifiers for example. Did you ever have any problems when you were changing the purifiers?

SS: No; I don't see what kind of problem that could be.

TL There wasn't, for example, a big spill or a big pile of the purifier wood chips?

SS: No, nuh-huh, no; that was taken care of.

TL: We talked about the site being closed. When you refer to the site being closed, can you tell us again what you mean by that?

SS: Well, it -- I don't quite understand what you mean "the site being closed".

TL: It converted from a manufactured gas plant to a propane site.

SS: Yes.

TL: Did you -- when you said you worked there 'till it closed.

SS: Yeah.

TL: Were you involved with the transition to propane?

SS: Yes. We would use the same storage tanks and the same building when we made the propane gas.

TL: Did you continue to work at the site after it became a propane site?

SS: Yes.

TL: How much longer?

SS: Until we got natural gas in town. I can't remember what year that was. Couple of years I believe.

TL: And after you left this plant site, after you got natural gas in town, what happened to this site?

SS: I really don't know because I got too busy working downtown, so I never even went back up there to -- to look. Well, I went by up there but nothing was going on at the time.

TL: So if I understand correctly, after natural gas was brought in to Bremerton, you moved to the Cascade offices; is that correct?

SS: That's correct.

TL: And what did you do for Cascade after you left this plant site?

SS: I was a service mechanic.

TL: And you didn't have to go back to this plant site to service anything?

SS: Not after we got natural gas; no.

TL: Okay.

SS: I went by up there just when I happened to be in the neighborhood, but nothing was going on, and then I just didn't go back again before, well, everything was torn down and gone next time I saw it.

TL: Were you ever involved in any part of the sale of any part of this property or the tearing down of any part of this property?

SS: No.

TL: I'd like to talk with you about other people who worked at the site. Do you remember, for example, who the supervisor at the site was?

SS: Yeah; his name was Dick Rutz.

TL: Can you spell his last name?

SS: R-U-T-Z; and he had a son by the name of Pat and the last thing I heard about him he was living in Gardiner up by --

TL: Would Gardiner be near Sequim?

SS: Yeah; near Sequim; yeah.

TL: Now, you said "he". Is this Pat or Dick?

SS: That's Pat; that's Dick's son.

TL: Is Dick still alive?

SS: No; he's gone.

TL: Do you know whether Pat is still alive?

SS: No, I don't.

TL: But Pat -- did Pat also work at the site?

SS: Yes.

TL: Do you remember the names of any others who worked at the site that might still be alive and able to tell us about it?

SS: No, I really don't. The only thing I can remember is a fellow by the name of Pete and I heard that he at one time was working for Washington Natural Gas and I believe he was in Oregon. So, I'm -- I'm -- that's the only one I can think of would be alive.

TL: Okay.

SS: I know the name of the other people if you need them.

TL: But are any of the -- are any of them alive ****?

SS: Not that I know of; no.

TL: Okay; if I may, I'm going to take a deep breath and ask you to take one and I'm going to check my notes and we'll see if there's anything else I need you to ask you.

SS: Okay.

TL: Mr. Simonson, I'll -- we've both talked and neither of us can remember anything more to ask. Is that -- at least I can't remember anything more to ask. Do you have anything more you want to say about it?

SS: No, I really don't.

TL: Okay.

SS: I -- that's all I can remember from the good old days.

TL: The attorney for Mr. Sesko and Mr. Sesko have not appeared, so I believe we are done. Thank you very much.

SS: Okay; my pleasure.

Videographer: So go off the video record; the time is 1:37 p.m.

BREMERTON GAS WORKS SITE
HISTORICAL INFORMATION

John West Notes Regarding Conversation With Melvin C. Clapp

- John West is a former attorney for Cascade Natural Gas Corporation. Mr. West discussed the former manufactured gas plant (MGP) with Mr. Clapp and prepared notes summarizing the discussion on April 21, 1997.
- At the time of the discussion, Mr. Clapp was a retired chairman of Cascade. Mr. Clapp was the District Manager of Cascade's Bremerton district between 1968 and 1969.
- Mr. Clapp said that between 1968 and 1969, "[the] main gas holders . . . were not there, but that the main building and some of the smaller tanks on the water side of the property were still in place."
- Mr. Clapp also said that the neighbor to the south of the MGP, "Lentz, Inc." [sic], was in operation between 1968 and 1969, and the "Lentz operation next door may have included wood treatment as well as pipe storage."

Linda Baker Notes from Meeting at Site

- Linda Baker is a former consultant for Cascade. Ms. Baker was present at two meetings at the MGP site in late 1997 together with representatives of Cascade (including one of its former attorneys, Tom Lindley), the then current owners of the former MGP property, and a former worker at the MGP, Sverre Simonsen (who attended one of the meetings). At the direction of Mr. Lindley, Ms. Baker prepared a summary of the meetings on October 7, 1997.
- Mr. Simonsen, in response to a 1944 Polk Directory map showing the MGP, said: "[t]he eight tanks oriented east/west across the southern portion of the site held several products. The five northern tanks held finished gas. The three tanks to the south held 'creosote', 'bug juice' and propane. The creosote (assumed to be tarry MGP residuals) was of very high quality (4 percent water)."
- Mr. Simonsen also said, "[t]he gas holder . . . held creosote and water by-products and was maybe 15 feet deep."
- Mr. Simonsen also said, "[the] small scrubber tank was located on the north side of the gas holder (where a rectangular depression with four sections exists on the pavement)."

John West Notes Regarding Conversation With Ed White

- Ed White was a Cascade employee stationed in the Bremerton office between 1964 and 1965. Mr. West discussed the former MGP with Mr. White and prepared notes summarizing the discussion on January 26, 1998.
- Mr. White said when he worked at the Bremerton office, the structures still in place at the MGP consisted of, "an old brick building, some large tanks, and some concrete piers which supported the tanks (cradles)."
- Mr. White also said that between 1964 and 1965, "most or all the tanks were removed and the concrete piers were jackhammered and the rubble hauled away."
- Mr. White also said that between 1964 and 1965, Cascade used the MGP property to store materials such as pipe and fittings.

Hello Ralph -

I hope you are well! See 2 copies of the Final summary and a strikeout version for your review. Please keep a copy of the Final Summary and sign the other. Please also initial each page of the version you return to us.

Thank you,

Nathan

NATHAN;

4/1/14

I APPRICIATE WHAT YOU HAVE DONE IN INTERVIEWING AND PREPARING THE SUMMARY. THE INFORMATION IS FACTUAL.

I'M SORRY IF I CAUSED THE FINAL DOCUMENT TO TAKE LONGER THEN ANTICIPATED.

THANKS AGAIN FOR THE EFFORT.

TAKE CARE,

Ralph

SUMMARY OF INTERVIEWS WITH MR. RALPH JUDD

BREMERTON GAS WORKS SITE

Interviewee Name:	Mr. Ralph Judd	**Interviewed by:**	Mark Larsen and Nathan Soccorsy, Anchor QEA, LLC
Date of Interviews:	December 20, 2013 and January 17, 2014	**Memorandum Date:**	March 2014

Introduction

Mr. Ralph Judd is a life-long resident of Bremerton, Washington. Nathan Soccorsy of Anchor QEA, LLC (Anchor QEA) met Mr. Judd during performance of sampling activities at the former Bremerton Gas Works Site (Site) in late 2013. Mr. Judd introduced himself as someone who had grown up in the neighborhood between the 1930s and 1950s and recalled conditions in the area and at the former gas works during that time. He offered to speak with EPA, Cascade Natural Gas Corporation and/or Anchor QEA about his recollections.

This memorandum summarizes Mr. Judd's recollections as described in two interviews with Mark Larsen (also of Anchor QEA) and Mr. Soccorsy. The interviews were conducted at Mr. Judd's home on December 20, 2013, and January 17, 2014. This interview summary is based on notes transcribed by Anchor QEA, which were reviewed and corrected by Mr. Judd on March 6, 2014.

Mr. Judd never worked at the former gas works, and has no involvement in ongoing activities at the Site. However, Mr. Judd lived and worked in the vicinity of the former gas works and described the locations and features that are depicted on Figure 1. Figure 2 is a sketch drawn by Mr. Judd in advance of the interviews and provided to Anchor QEA on December 20, 2013.

Summary

Mr. Judd lived in the vicinity of the former gas works during his youth. He was born in 1927. At that time his family lived at 812 Park Avenue. His family subsequently moved to a house located at 1310 Victoria Avenue (see Figure 1), several blocks south (approximately 1,800 feet) of the former gas works, where they lived from 1928 to 1936. Mr. Judd recalls

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walking up Thompson Avenue with his sisters to access a sandy beach in the area of the current Port Washington Marina, immediately west of the former gas works dock.

In 1936 his family moved to a house located at 1604 Naval Avenue (Figure 1), several blocks to the west of the former gas works. He and several of his childhood friends would play in the vicinity of the former gas works up until the time he entered high school in January 1942. As described below, the former gas works was not fenced at that time and, on occasion, he and his friends played on the former gas works property. After entering high school in 1942, Mr. Judd began working for the City of Bremerton. He was later employed (between August 1942 and March 1945) by the Lent and Blomberg families and/or Lents, Inc. (collectively, Lents) to work on the property located at 1723 Pennsylvania Avenue.

In April 1945 Mr. Judd joined the U.S. Merchant Marine (Merchant Marine). Between 1946 and 1949 he returned intermittently to the neighborhood. He left the Merchant Marine in September 1949 and spent most of the next year living with his family on Naval Avenue and working several summer months at the Navy ammo depot at Bangor. During that year he spent some time fishing in Port Washington Narrows in the vicinity of the former gas works, and specifically off of the former Lents dock located immediately to the east of the former gas works (Figure 1).

In September of 1950, during the Korean War, Mr. Judd was drafted into the U.S. Army. He traveled to various locations with the Army for training and assignments, returning to the neighborhood briefly during the winter of 1951. After the war (October 1952), he returned to Bremerton and was employed as a helper in the naval shipyard. He later became an apprentice and his shipyard career evolved from there.

Mr. Judd was married in August 1957 and moved out of his family's house on Naval Avenue. While he remained a life-long Bremerton resident and was employed at the shipyard until 1985, he did not recall spending any significant time in the vicinity of the former gas works after 1957.

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Based on the foregoing history, Mr. Judd has personal recollections of conditions at the Site between approximately 1933 and 1942 (between the ages of 6 and 15 years old), and between late summer 1949 and September 1950 (age 22 to 23) when he was drafted into the Army. His recollections are less detailed between 1942 and 1949 and between 1950 and 1957. He does not have personal knowledge of conditions in the area of the Site after 1957, except what he read about in newspapers about the Site.

1. **Early Recollections (1933-1936)**

   During this period, Mr. Judd lived at 1310 Victoria Avenue, and he and his sisters occasionally played on the beach at the current location of the Port Washington Marina, just west of the former gas works. At that time, the area included a shallow sandy beach that could be accessed from Thompson Drive.

   Mr. Judd and his sisters would walk through the neighborhood from their family home down Thompson Avenue to access the sandy beach. He recalls doing this from about age 6 until about age 9.

   Mr. Judd recalled that the former gas works operations were located to the east of Thompson Drive. He does not recall any gas works operations being located to the west of Thompson Drive. He recalled that area being vacant at that time.

2. **Later Recollections (1936-1942)**

   After 1936, Mr. Judd's family lived to the west of the former gas works at their house at 1604 Naval Avenue (Figure 1). He had several friends in the neighborhood, including the Heathman children, and recalls playing at the former gas works property and in the vicinity. Recollections regarding specific events and areas are summarized below as communicated during the interviews.

   - **Former Gas Works Property:**
     - The former gas works property was not fenced during this period. Mr. Judd and his friends could walk onto the property. The sketch in Figure 2 (attached) includes his recollections of the layout of the former gas works at

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that time. The sketch also includes observations from later time periods for the surrounding properties.

- Mr. Judd's recollection was that the operational areas of the former gas works were well kept and orderly.
- In approximately 1939 or 1940, Mr. Judd recalled playing at the former gas works with a friend of his named Tommy Heathman. At that time an earthen pit containing black tar was located in the southwest corner of the former gas works property, just east of Thompson Drive. The pit had sloping earthen sides and was approximately 15 feet wide and 20 to 25 feet long in the north-south direction. His friend Tommy fell into the pit and went home covered in tar. Mr. Judd remembers that Tommy got into trouble with his mother because he ruined his clothes. Mr. Judd did not know how the pit was used or what happened to the tar in the pit.
- During this period, Mr. Judd recalled walking around the former gas work property and looking into the gas machine building. He could see the gas machines through the doorway. The men who operated the gas works would periodically come out of the building with wheelbarrows full of ash and cinders. Mr. Judd recalled seeing the men dump the wheelbarrows along the ravine to the east and northeast of the former gas works and along the bluff to the north of the former gas works. There was little or no vegetation along the bluff at that time.

- **Former Gas Works Dock:**
  - Mr. Judd recalled the former gas works dock located to the north of the facility and how it was used to moor and offload barges of coal. The dock was a high catwalk structure without a hand railing. He recalled seeing the barges moor along the inshore side of the dock, which presumably were positioned during high tide conditions (see Figures 1 and 2). A 3- to 4-foot-wide bucket was winched down along a cable to unload the coal. The bucket alignment could be adjusted from east to west using a hand-cranked block and tackle system on the dock. In this way, the bucket could be used to unload the entire barge without having to relocate the barge.

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- Mr. Judd recalled seeing the material unloaded, and that it was angular like fractured coal. He also recalled that when coal spilled on the beach, local residents would pick it up for their own use. Mr. Judd was aware that briquettes were used at the former gas works, but did not specifically recall unloading of briquettes at the facility.
- Mr. Judd did not recall seeing loading or unloading of liquid products at the dock, and did not recall seeing piping on the dock. He also never accessed the dock structure, as he had a fear of heights and was not comfortable walking out on the dock, which had no railing.
- Mr. Judd recalled that some boys from the neighborhood would go down to the former gas works dock, climb onto the pilings, and dive off into the water.
- Mr. Judd recalled picking mussels and pile worms off the dock pilings for use as bait when fishing. At high tide he would fish for perch from a small boat near the dock and pilings. Mr. Judd did not recall seeing any spillage of tar or oil near the dock, but did recall that the pilings were made of creosote-treated timbers.

- **Intermittent Creek, Concrete Plant, and Ravine:**
  - Mr. Judd recalled that there was an intermittent creek that collected surface drainage during the wet months just to the east of Thompson Drive. The creek was small, only 1 to 2 feet across. The creek cut to the northeast across the property located at 1723 Pennsylvania Avenue, which is currently owned by Penn Plaza Storage LLC. In that area, the creek was still small and ran in a small ravine or ditch that was approximately 4 to 5 feet below the grade of the surrounding properties.
  - Mr. Judd recalled that people would bring trash and fill and place it in this low-lying area. He did not recall seeing any gas works operations or fill materials being placed there. This area was filled in before he began working for the Lents in August 1942.
  - The creek dropped into a deeper ravine to the east of the former gas works. There, the creek and ravine dropped toward the beach down below. He knew that this area was filled, but did not have any specific knowledge about how it

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was filled or who did the filling. Mr. Judd did not recall seeing gas works wastes or tar in this area (other than the wheelbarrow dumping of ash and cinders farther north along the bluff as described above).

- Mr. Judd recalled that the concrete plant located along Thompson Drive was built around 1937 to 1939 or thereabouts.

- **Moorage and Marina:**
  - Mr. Judd recalled that boats were moored along floats where the Port Washington Marina is currently located through the 1940s. He remembers live-aboards being located there during World War II.

3. **Teenage Years (1942-1945)**

In 1942, Mr. Judd began working and entered high school. As he was busy with work, high school, and other interests, he spent less time playing in the neighborhood than when he was younger.

- **Bulk Petroleum Terminals:** Mr. Judd recalled that between about 1940 and 1945, the naval shipyard expanded its western boundary and the railroad was extended from Shelton to Bremerton. Prior to that time, several petroleum facilities were located on the waterfront of Sinclair Inlet west of Bremerton. When the railroad was constructed, these facilities were required to relocate, with some operations moving near the former gas works.
  - He recollected that the former Lents dock, east of the former gas works dock, was well built and had a wooden railing. He fished off the dock at various times during the 1940s.
  - He recalled the former Richfield dock located where the Port Washington Marina is currently located. The dock was connected to an upland tank farm by above-ground pipelines that ran along the wooded area at the west side of the property located at 1701 Thompson Drive, which was formerly owned by Richfield Oil Corporation and operated as a petroleum storage and distribution facility. Mr. Judd recalled that Gene Lobe owned the Richfield franchise in Kitsap County, and he remains a resident in the area.

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- Mr. Judd remembers seeing oil barges unloaded at the former Lents and Richfield docks, and that it was common to see episodic oil sheening on the water along the beach when the barges were at the docks.
- Mr. Judd recalls another oil terminal that was formerly located farther west of the Port Washington Marina at Anderson Cove.

- **Sailor Jack:** Mr. Judd recalled that a man known as "Sailor Jack" had a small floating boat house located northeast of the end of Pennsylvania Avenue, just north of the property located at 1702 Pennsylvania Avenue, which is currently operated by SC Fuels as a petroleum storage and distribution facility. He recalls that the boat house had a roof, and there was a stairway down to the beach.
- **Working at Lents (1942-1945):** Mr. Judd worked for the Lents between August 1942 and March 1945. He worked in several different positions, as described below:
  - In the sheet metal shop (located along Pennsylvania Avenue), Mr. Judd conducted assembly of metal products. The sheet metal shop was a two-story building, including both the machine shop and warehouse. Mr. Judd recalled that there was a small plating operation located along the western side of the metal shop. Metal products were cleaned in a tank containing lye.
  - He recalled Fred Gessup, who managed the oil deliveries for the Lents. Mr. Judd's cousin worked with Mr. Gessup as an office assistant. The oil delivery trucks were parked and cleaned outside of the main building. The trucks would be loaded with fuel at the tank farms north of the main building.
  - Barney Lee lived in the house located just northeast of the tank farms around this time. The "house" shown on Figure 2 is the approximate location of Mr. Lee's residence.
  - One summer Mr. Judd worked in the warehouse and yard as a swamper (laborer). His job included assisting with deliveries and picking up appliances for repair at the Lents facility.
  - Mr. Judd also worked a few months in the winter of 1942 to 1943 in the paint shop located along Thompson Avenue. He remembers making first-aid boxes

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for the military and wearing respirators. His job was to fill and repair dings and other defects.

4. Early 20s (1949-1950)

Between late summer 1949 and September 1950 when he was drafted, Mr. Judd lived with his parents at their house on Naval Avenue. He recalls fishing off the former Lents dock during this period. It was used for oil unloading at that time. He did not recall fill activity in the area at that time, and noted that there was not much room for filling with the tank farm and Mr. Lee's house on one side, and the former gas works on the other. He did not recall seeing spills of oil, tar, or other materials in the area, though he was mostly interested in the dock for fishing. He recalls that the dock was wooden and had a railing. He did not recall what the piping looked like on the dock, though he remembered seeing oil barges unloading at the dock.

5. Other Regional Recollections

- Mr. Judd did not recall any organized landfilling activity at the ravine east of the former gas works or along the intermittent creek east of Thompson Drive. He did, as noted above, recall seeing miscellaneous garbage and fill dumped along the creek prior to 1942 when he began working for the Lents. By then, the creek in this area had been filled.
- Mr. Judd recalled that during the 1930s there was a landfill located farther east, where Roosevelt Field is now. It was in a low spot and the garbage would occasionally catch fire. He recalled that people would salvage food and jars from the dump during the depression. Later, bachelor housing and a community center were built over the dump. One of the buildings settled and had to be torn down.

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This interview summary and the attached Figure 1 are consistent with my recollections as communicated during my interviews with Anchor QEA:

Ralph R Judd

Mr. Ralph Judd

4/1/2014

Date

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FIGURES

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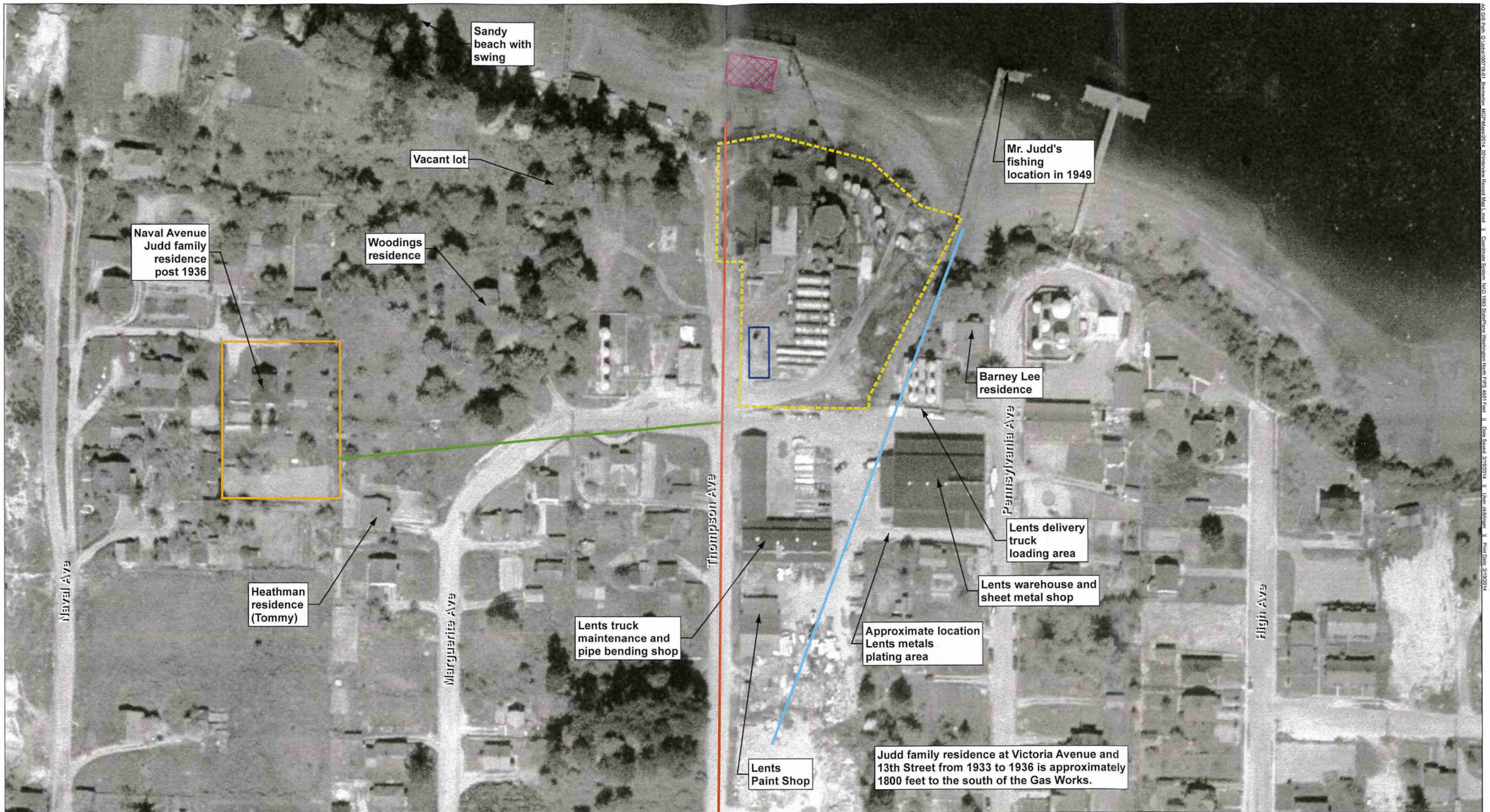

AQ GIS Path: Q:\Jobs\100719-01 Bremerton MGP\Maps\2014_02\Interview Record Map L.mxd || Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet || Date Saved: 3/19/2014 || User: ckiblinger || Print Date: 3/19/2014

- Approximate location of intermittent stream
- Walking route to beach circa 1933
- Walking route to beach from 1936 to 1942
- Coal barge mooring area
- Judd property boundary (approx.)
- Approximate Vicinity of 15-ft x 25-ft Tar Pit
- Former Gas Works Location

NOTE:
1946 aerial photograph.

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Feet
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Ralph Judd Interview Summary Map
Bremerton Gas Works
Bremerton, Washington

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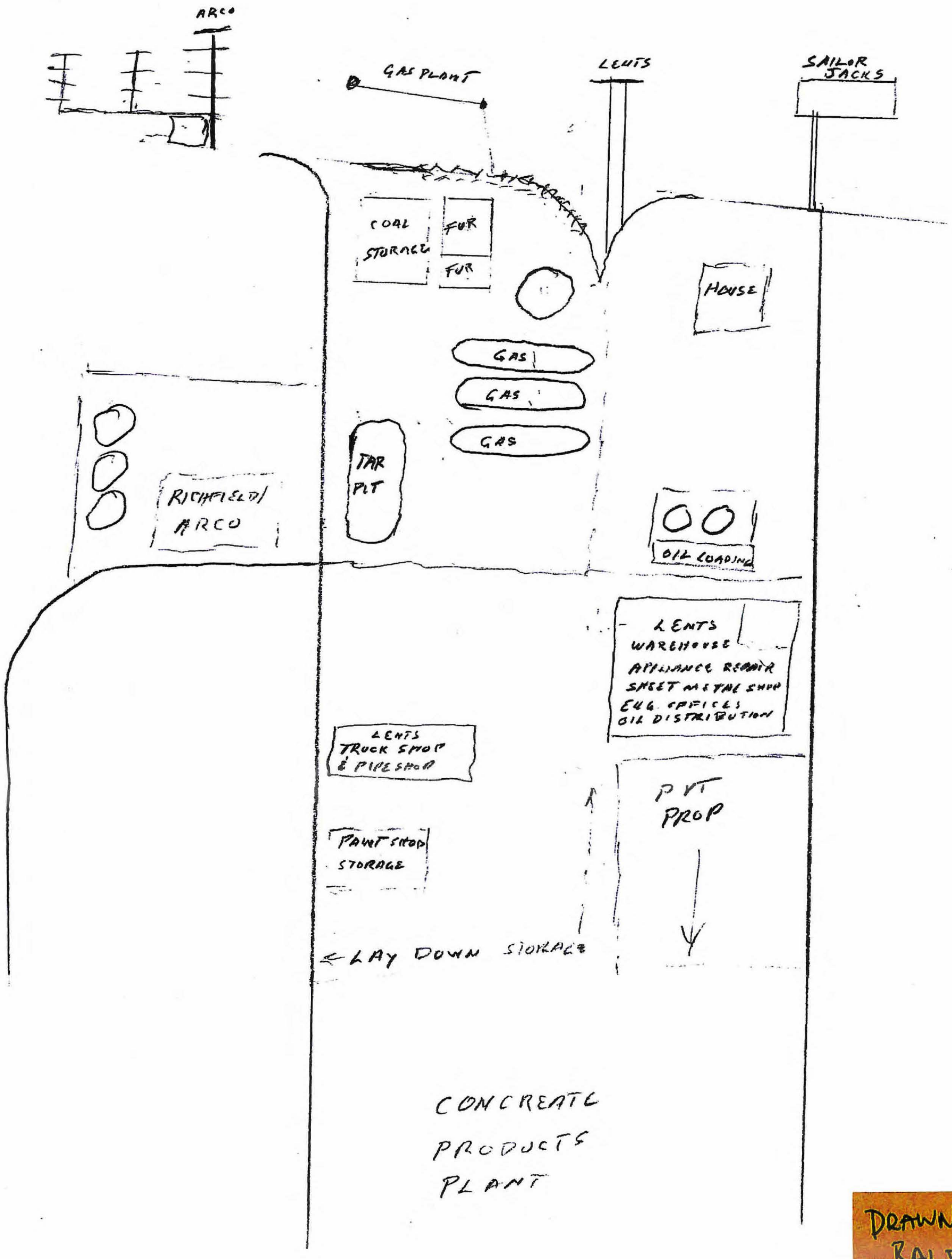
Aspect CONSULTING | ANCHOR QEA | FIRM: ANCHOR QEA; DRAWN BY: ckiblinger | FIGURE NO. 1



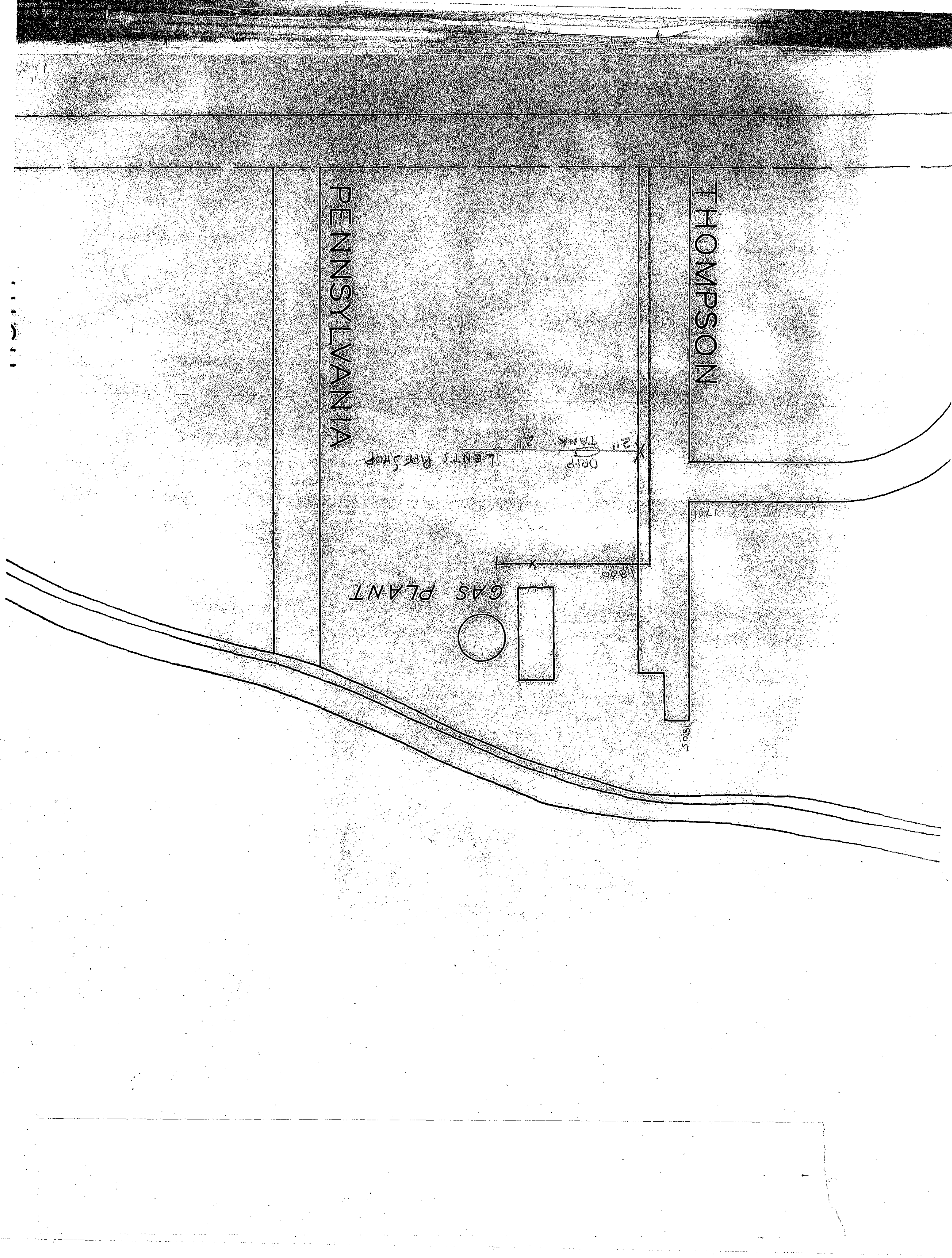
DRAWN BY: RALPH JUDD

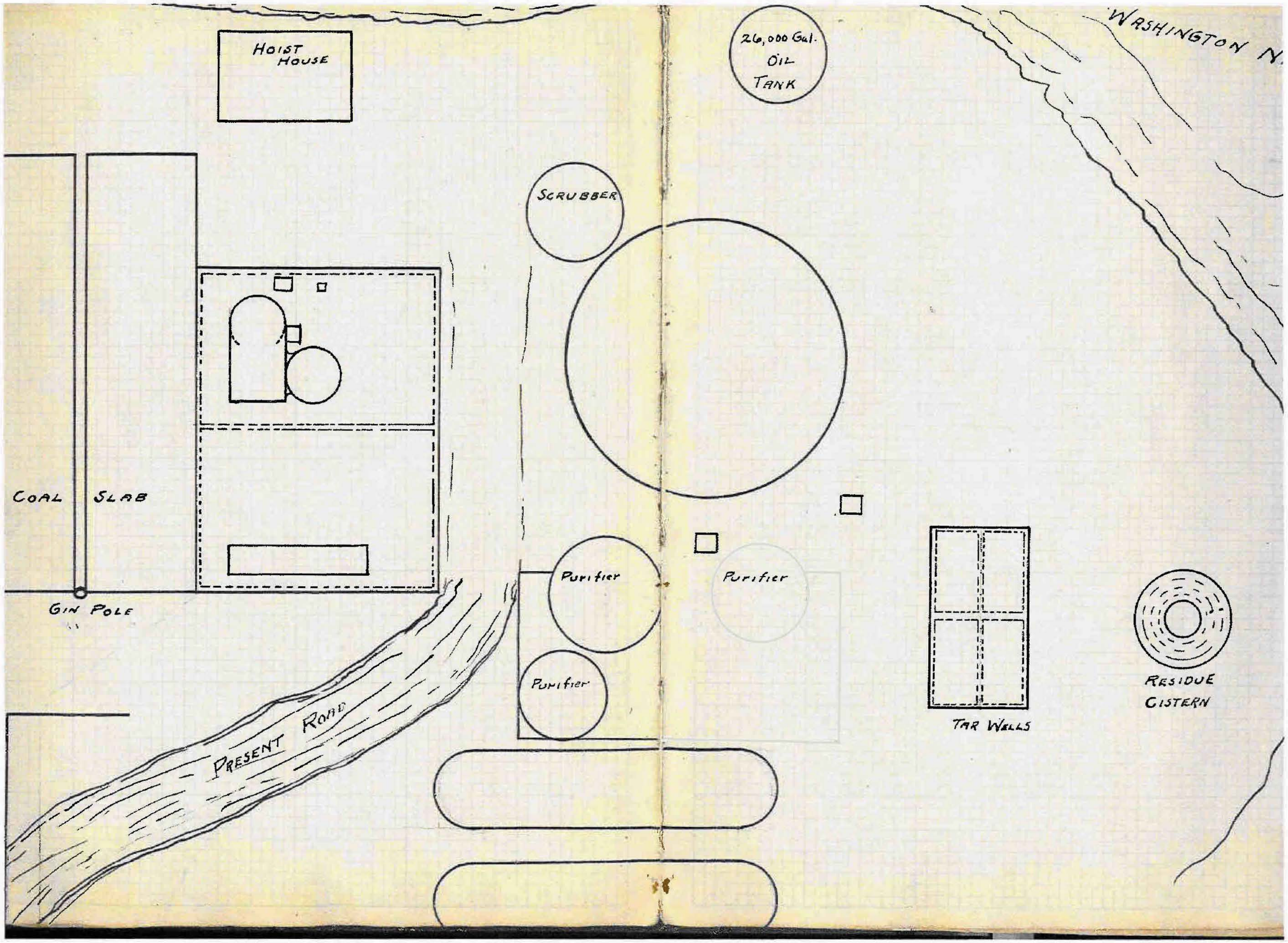
GIVEN TO: MARK LARSEN NATHAN SOCCORSY 12/20/2013

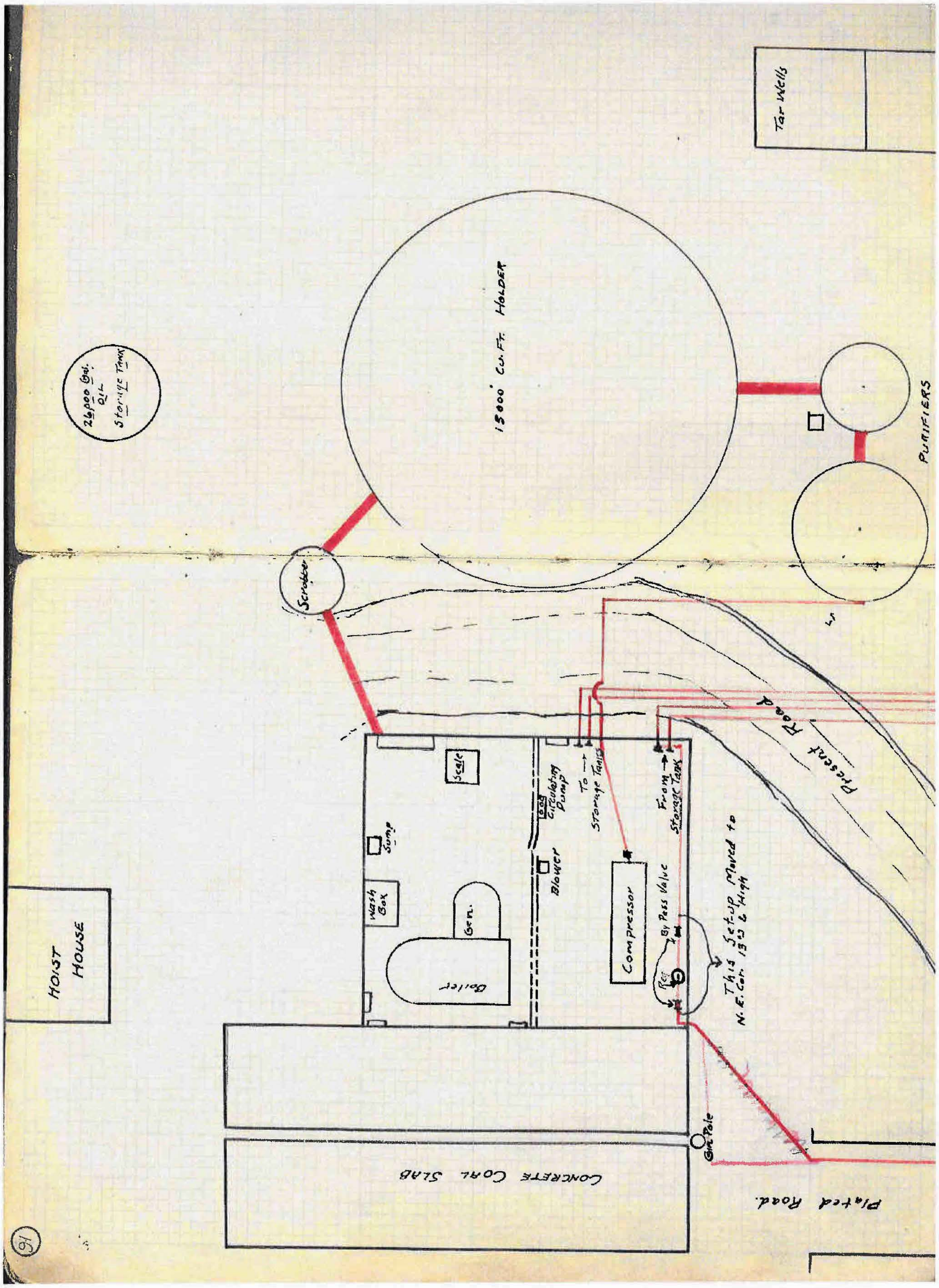
NOTES:
1. This depiction presents features and recollections over multiple dates.
2. Not to scale.

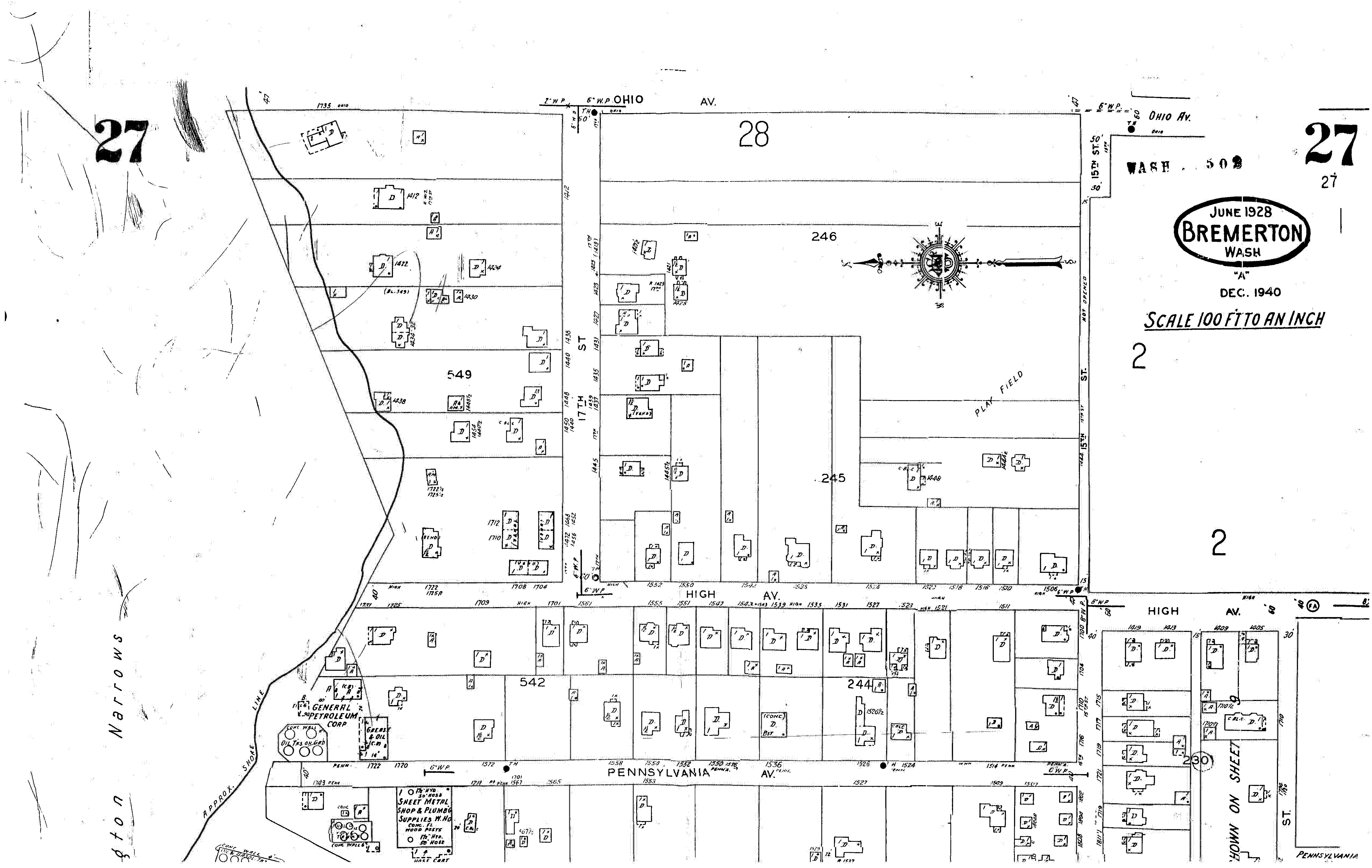
Ralph Judd Sketch
Bremerton Gas Works
Bremerton, Washington

Aspect CONSULTING | ANCHOR QEA | FIRM: ANCHOR QEA | FIGURE NO.
DRAWN BY: ckiblinger | 2

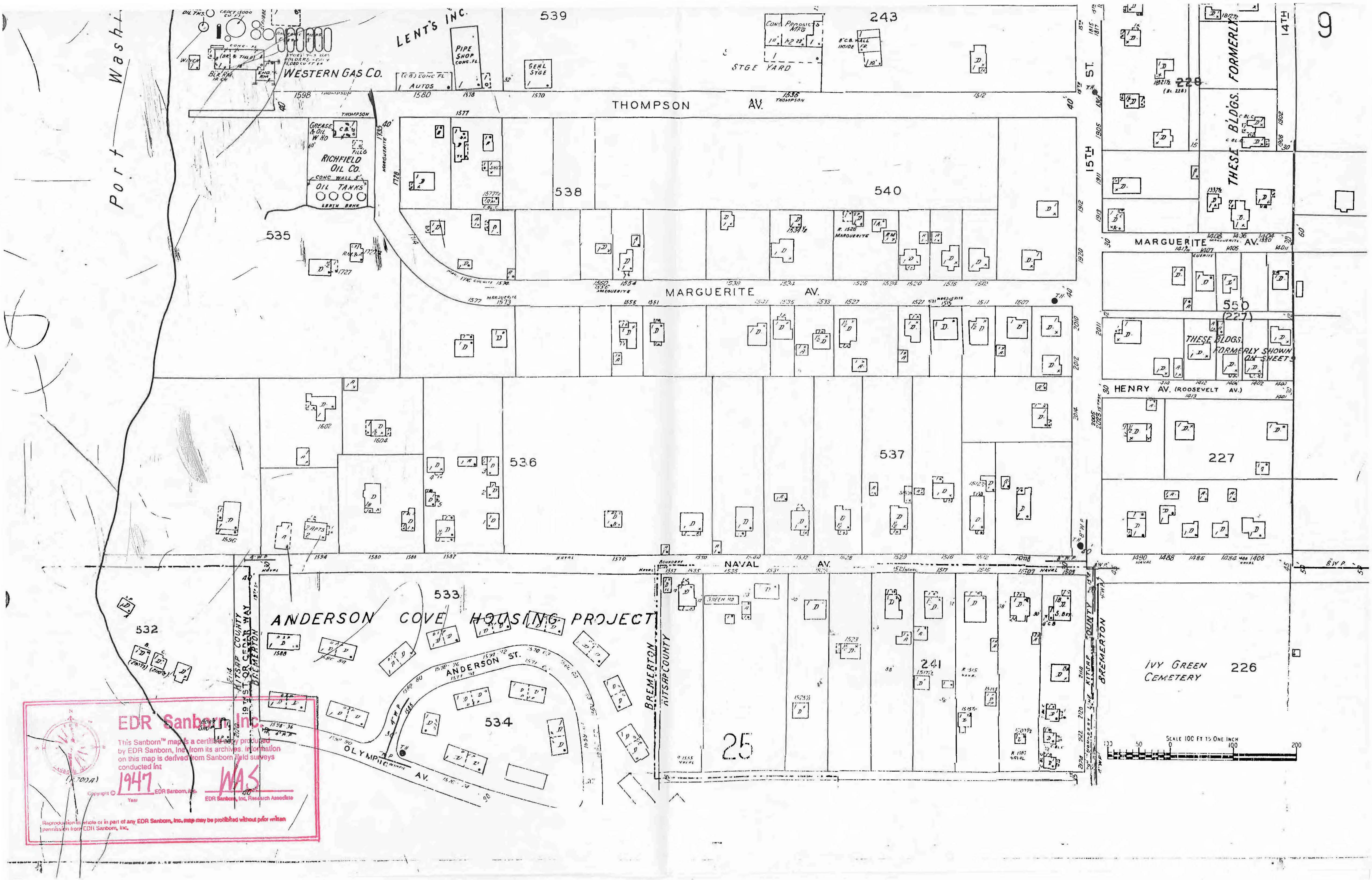

PENNSYLVANIA
THOMPSON
GAS PLANT
DRIP TANK
1800
1805
1701


HOIST HOUSE
26,000 Gal. OIL TANK
WASHINGTON N.
SCRUBBER
COAL
SLAB
GIN POLE
Purifier
Purifier
Purifier
TAR WELLS
RESIDUE CISTERN
PRESENT ROAD


16
26,000 Gal. Oil Storage Tank
15000' Cu. Ft. Holder
Tar Wells
Purifiers
Scrubber
Present Road
Hoist House
Scale
Sump
Circulating Pump
Wash Box
Gen.
Boiler
Blower
To → Storage Tanks
From → Storage Tank
Compressor
By Pass Valve
Reg.
This Set-up Moved to N.E. Cor. 13th & High
Concrete Coal Slab
Gas Pole
Plated Road.

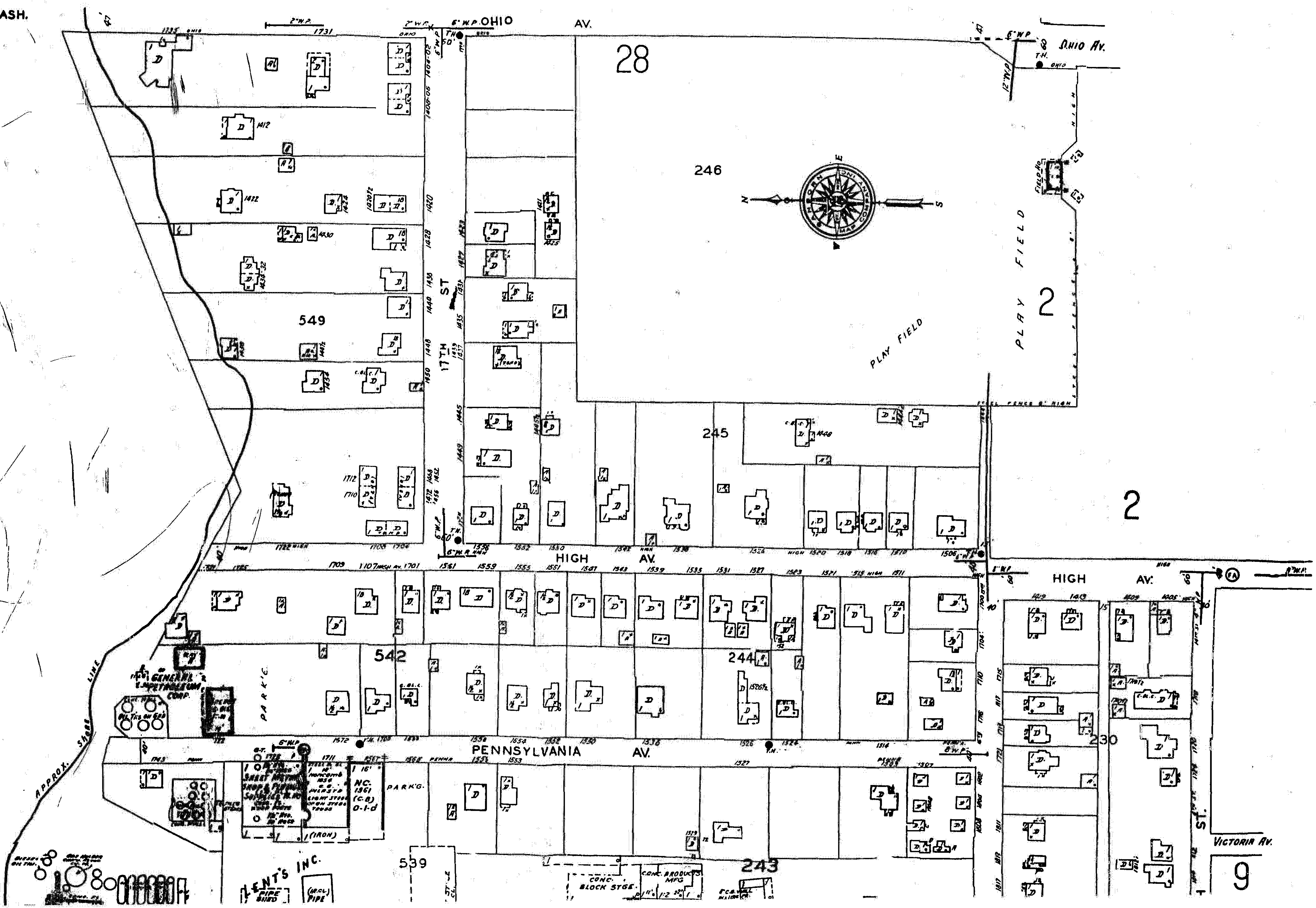


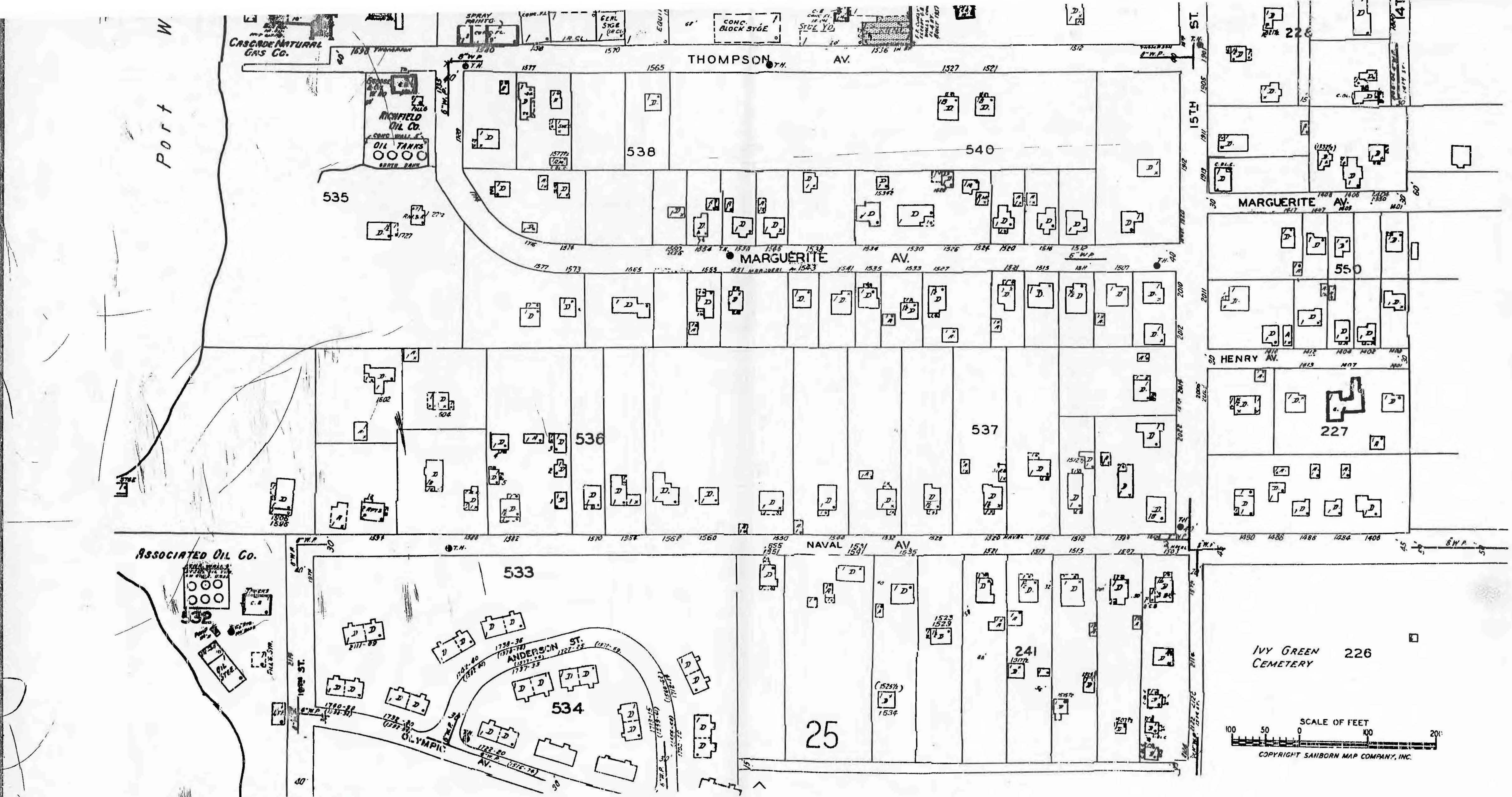
27
OHIO AV.
28
246
245
549
542
244
17TH ST
15TH ST.
HIGH AV.
PENNSYLVANIA AV.
PLAY FIELD
GENERAL PETROLEUM CORP
GREASE & OIL
OIL TKS ON GRD
SHEET METAL SHOP & PLUMB'G SUPPLIES W.HO.
APPROX. SHORE LINE
Narrows
WASH 502
JUNE 1928
BREMERTON
WASH
"A"
DEC. 1940
SCALE 100 FT TO AN INCH
2
230
SHOWN ON SHEET


9
Port Washington
WESTERN GAS CO.
LENT'S INC.
PIPE SHOP
GEN'L STGE
RICHFIELD OIL CO.
OIL TANKS
GREASE & OIL W'HO
STGE YARD
CONS. PRODUCTS MFG
THOMPSON AV.
MARGUERITE AV.
HENRY AV. (ROOSEVELT AV.)
NAVAL AV.
15TH ST.
14TH
THESE BLDGS. FORMERLY
THESE BLDGS. FORMERLY SHOWN ON SHEET 9
ANDERSON COVE HOUSING PROJECT
ANDERSON ST.
OLYMPIC AV.
KITSAP COUNTY
BREMERTON
19TH ST. OR CEDAR WAY
IVY GREEN CEMETERY
539
243
228
538
540
535
550
(227)
536
537
227
533
532
534
241
226
25
SCALE 100 FT TO ONE INCH

BREMERTON, WASH.

27





DNR-00050221

APPENDIX D

DNR Lease History Documents

September 15, 2014

To: Bill Ryan, EPA
From: Rolin Christopherson, Washington State Department of Natural Resources

Draft Summary:

Lease History in Vicinity of Old Bremerton Gas Works

Area of Industrial Land Use outside of the Parcels of Interest

The Bridgeview Marina Inc. Harbor Area: The Bridgeview Marina (formerly known as the Seven J's or Port Washington Marina) is located 3.487 acres of harbor area fronting Government Lots 6 and 7, Section 11, Township 24 North, Range 1 East, W.M., between Waterway No. 4 on the west and Renn Stroll on the east.

Harbor area lease 1044 was issued to C.G. Hansen. The leased area (approximately 3.3 acres) fronted parts of Lots 6 and 7, Township 24 North, Range 1 East. The proposed improvements were: "a dragway or grid for hauling small boats out of the water." Harbor area lease 1044 had a term of 10 years commencing on November 1, 1934. Harbor area lease 1312 was issued to C.G. Hansen for a term of 10 years commencing on November 1, 1944. The lease area included the 450 feet of the eastern portion of the previous lease 1044.

The harbor area on the eastern portion of the Hansen lease area eventually became occupied by the Tidewater Oil Company and William M. Slonecker. This portion of the harbor area was once home to petroleum terminals that serviced upland tank farms for the Tidewater/Phillips Oil Companies adjacent to the waterway, and the Richfield Oil Company located east of Renn Stroll.

Tideland Oil: Oil companies have leased 0.45 acres of harbor area fronting lot 6, section 11, township 24 north, range 1 east and Waterway No. 4 from the date of assignment from Emma Annie Akers to the Petroleum Navigation Company on May 7, 1946 to May 6, 1976. The Tidewater Oil Company built a 100 feet long by 10 feet wide dock with two dolphins at the end of the dock, which carried petroleum pipelines to the bulk plant on the adjacent uplands.

On May 7, 1946, harbor area lease 1348 was issued to Emma Annie Akers for a 10 year term. On September 4, 1946 lease 1348 was assigned to Petroleum Navigation Co. On March 8, 1948 lease 1348 was assigned to the Tide Water Associated Oil Company. On May 7, 1956 harbor area lease 1615 was issued to Tide Water Associated Oil Company for a ten year term. On August 31, 1956, Tide Water Associated Oil Company sent notification that their corporate name has been changed to Tidewater Oil Company.

Philips Petroleum Company had purchased portions of the Tidewater Oil Company on July 15, 1966. On September 16, 1966 lease 1615 was assigned to Philips Petroleum Company. Harbor area lease 2027 was issued to Philips Petroleum Company on May 7, 1966 for a ten year term. Lease 22-002399 was issued to William R. Dane for a ten year term commencing on May 7, 1976. On May 23, 1983, lease 2399 was amended to amend its expiration date to November 1, 2004. On May 26, 1983, lease 2399 was assigned to Port Washington Properties. On December 14, 1983, lease 2399 was assigned to Port Washington Marina Condominium Owners Association. The leasing chronology for this site:

- Harbor area lease 1348 — Emma Annie Akers — May 7, 1946-1956
- Assignment to — Petroleum Navigation Company — September 4, 1946
- Assignment to — Tide Water Associated Oil Company — March 8, 1948
- Harbor area lease 1615 — Tide Water Associated Oil Company — May 7, 1956-1966
- Name change to — Tidewater Oil Company — August 31, 1956
- Assignment to — Philips Petroleum Co. — September 16, 1966
- 22-002027 — Philips Petroleum Co. — May 7, 1966-1976
- 22-002399 — William Dane — 1976-2004
- Assignment to — Port Washington Properties — May 26, 1983
- Assignment to Port Washington Marina Condominium Owners Association — December 14, 1983
- 22-002332 — Port Washington Marina Owners — August 1, 1993-2023
- Assignment to — Seven J's Investments — December 11, 2003
- 22-A02332 — Seven J's Investments — December 1, 2004-2034
- Assignment to — Bridgeview Marina Inc. — May 28, 2014

Slonecker Lease Area: C.G. Hansen reduced his lease area (lease 1044), and William Slonecker applied to lease 0.79 acres of harbor area for a "boat house and marine ways" on December 15, 1944. W.M. Slonecker and Helen S. Slonecker sublet the harbor area to Carl G. Lundgren and Frank J. Taylor, doing business as Peninsula Boat Works, on June 19, 1946 for the purpose of "operating and maintaining a boat works."

Harbor area lease 1342 was issued to W.M. Slonecker for a 10 year term commencing on March 26, 1946. Harbor area lease 1625 was issued to W.M. Slonecker for a 10 year term commencing on March 26, 1956. Lease 22-002018 was issued to Helen S. Slonecker for a 10 year term commencing on March 26, 1966, (lease was cancelled on March 23, 1972). Lease 22-002396 was issued to Sea Gate, Inc. for a 28 year term commencing on November 1, 1976.

By 1988, the Port Washington Marina Owners Association requested the consolidation of leases 2332, 2396 and 2399. Lease 2396 was terminated on July 31, 1993 as part of a lease consolidation, and the harbor area was included in the lease area of 22-02332 which is currently under lease to Bridgeview Marina Inc.

In vicinity of former ARCO dock

The Cary and Richfield Oil Leases: Richfield Oil sublet 0.75 acres harbor area fronting lot 7, section 11, township 24 north, range 1 east from C.G. Hansen and Vern Cary with H.G.R. Conners and Willa

Carey from 1942 to 1954. Between 1954 and 1974, Richfield Oil leased that harbor area directly from the State.

The former Richfield Tank Farm, was located on parcel 009-00 and was connected to the Harbor Area by a pipeline located over the western portion of parcel 010-00 (a portion of the pipeline may have been located on parcel 3-098). The Harbor Area leased by Richfield is now a portion of the Bridge View Marina (former Port Washington Marina).

The Cary and Richfield harbor area was originally part of the Hansen harbor area lease 1312. Lease 1312 was assigned to Vern Carey and H.G.R. Conners on November 19, 1950. The improvements in the leased area are described as a "small boat moorage operated by Bremerton Marine Service also 2-bedroom house used as office and living quarters, 1-work shop…" and an oil dock claimed by the Richfield Oil Co.

On October 30, 1954, the Vern and Willa Carey assigned all their right, title and interest in the easterly 150 feet, or 0.75 acres of leased harbor area as measured on the inner harbor line from the west line of Lot 11, Supplemental Plat of Bay View Garden Tracts to the Richfield Oil Corporation. This assignment was made subject to an agreement and sublease between the Richfield Oil Corporation and the Careys that granted the Careys the right to use the premises "to keep and maintain their work shop, storage shed, office and living quarters, cat walks and floats on said property during the term of this sublease and any extensions hereof." This agreement allowed joint occupation of the harbor area by Richfield Oil and the Careys over which the Richfield Oil pipeline crossed.

Harbor area lease 22-001971 was issued to the Richfield Oil Corporation commencing November 1, 1964 for a ten year term. In 1974, The Atlantic Richfield Corporation successor by merger to Richfield Oil Corporation, cancelled lease 22-001971. Harbor Area Leasing Chronology:

• Harbor area lease 1044	C.G. Hansen	November 1, 1934-1944
• Harbor area lease 1312	C.G. Hansen	November 1, 1944-1954
• Assignment to	Vern Carey & H.G. R. Conners	November 18, 1950
• Assignment to	Willa Carey	October 10, 1952
• Harbor area lease 1548	Vern and Willa Carey	November 1, 1954-1964
• Harbor area lease 1553	Richfield Oil Co.	November 1, 1954-1964
• 22-001971	Richfield Oil Co.	November 1, 1964-1974
• 22-001974	Vern and Willa Carey	November 1, 1964-1974
• 22-002332	Port Washington Marina	November 1, 1974-2023
• Assignment	Seven J's Investments	December 11, 2003
• 22-A02332	Seven J's Investments	December 1, 2004-2034
• Assignment to	Bridgeview Marina Inc.	May 28, 2014

The Snow Lease (22-002332): The former Vern and Willa Carey lease area (22-001974) with the former Richfield Oil lease area (22-001971) was combined into lease 22-002332 for the use of approximately 2.0 acres of harbor area. Lease 22-002332 was issued to Darwin L. Snow and Susan J. Snow commencing on November 1, 1974 for a 30 year term.

- 22-002332 Darwin L. Snow and Susan J. Snow November 1, 1974 – 2004
- Assignment to Sharon E. Snow January 28, 1976
- Assignment to Sea Gate, Inc. August 4, 1976
- Assignment to Sea Brim Inc. September 14, 1981
- Assignment to Port Washington Properties May 31, 1983
- Assignment to Port Washington Marina Condominium Owners Association December 14, 1983

In vicinity of former Gas Works dock

Western Gas Company leases (Harbor area leases 935 and 1352): has leased 1.85 acres of harbor area fronting the Bay View Garden Tracts from 1930 to 1959. After 1959, this harbor area was leased by John B. Verhelst until December 11, 1975 and then by John C. Verhelst and Franklin Cooper until May 31, 1983. In May 1983, the Port Washington Properties assumed the lease for this harbor area and developed a marina over the western portion of this lease area. In 1993, this portion of the harbor area located west of Renn Stroll was merged with other harbor area located to its west and leased to the Port Washington Marina Condominium Owners Association.

Verhelst leases (22-001783, 22-002141, and 22-002523): John B. Verhelst leased 1.88 acres of harbor area fronting tracts 1 and 11 and intervening Renn Stroll, Supplemental Plat of Bayview Garden Tracts for a 10 year term commencing December 8, 1959, for the purpose of a "Bulk Plant Site."(22-001783).

Western Gas Company harbor area leases chronology:

- Harbor area lease 935 Western Gas and Utilities Corp. 1930-1945
- Harbor area lease 1352 Western Gas Co. of Washington 1945-1960
- Lease Cancelled February 10, 1959
- 22-001783 John B. Vernhelst December 8, 1959-1969
- 22-002141 John B. Vernhelst October 17, 1969-1979
- Assignment to Franklin R. Cooper & John C. Verhelst January 9, 1976
- 22-002523 Franklin R. Cooper & John C. Verhelst December 8, 1979-1989
- Assignment to Port Washington Properties June 13, 1983-1993
- Assignment to Jack T. Champion July 15, 1987, expired on December 8, 1989
- 22-002332 Port Washington Marina Condo Owners 1993
- Assignment to Seven J's Investments December 11, 2003
- 22-A02332 Seven J's Investments December 1, 2004-2034
- Assignment to Bridgeview Marina Inc. May 28, 2014

Port Washington Marina Lease (22-002332): The Port Washington Marina lease area is comprised of four former lease areas: lease 2332; lease 2339; lease 2396; and the western portion of lease 2523 consolidated between 1982 and 1993 into a new harbor area lease 22-002332 containing 3.487 acres. This harbor area was historically used in conjunction with the former Tideland Oil and Richfield Oil tank farms as well as the western portion of the former Washington Gas Co. facility.

Port Washington Marina Condominium Owners Association Marina: In 1983, the Marina was constructed over the three adjacent lease areas 2332, 2396 and 2399. All of these leases were assigned to Port Washington Properties in May 1983. Lease 22-002332 was assigned to Port Washington Marina Condominium Owners Association on December 14, 1983. Harbor area lease 2332 with Port Washington Marina Condominium Owner's Association which combined leases 2332, 2396, and 2399 into one lease was executed on August 1, 1993 for a term of 30 years, for "maintaining finger floats, docks, and fixed piles to provide vessel moorage for a privately-owned and operated marina..." The new lease would extend from Waterway No. 4 to Renn Stroll, Supplemental Plat of Bay View Garden Tracts, in harbor area previously leased by the Western Gas Co.

On November 14, 1995, lease 22-002332 was assigned to Douglas Faulds and Donna Ernst. On December 18, 2003, harbor area lease 2332 was assigned to Seven J's investments. A new harbor area lease 22-A02332 was executed with Seven J's Investment for a thirty year term commencing December 1, 2004 for the use of "recreational and commercial vessel moorage and a marine pump out facility..."

Bridge View Marina (22-A02332): The Port Washington Marina lease, 22-A02332, held by Seven J's Investments was assigned to Bridgeview Marina Inc. a Washington corporation effective May 28, 2014.

Port Washington Marina Harbor Area Lease Chronology:

- 22-002332 — Darwin L. and Susan J. Snow — November 1, 1974-2023
- Assignment to — Port Washington Properties — May 31, 1983
- Assignment to — Port Washington Marina Condo Owners — December 14, 1983
- Termination of — Harbor Area Leases 2332, 2996. 2999 — August 1, 1993
- 22-002332 — Port Washington Marina Condo Owners — August 1, 1993-2023
- Assignment to — Douglas Faulds & Donna Ernst — November 14, 1995
- Assignment to — Seven J's Investments — December 18, 2003
- 22-A02332 — Seven J's Investments — December 1, 2004-2034
- Assignment to — Bridgeview Marina Inc. — May 28, 2014

Harbor area and beds of navigable water directly north of Thompson Drive

Cascade Natural Gas Corporation easement (51-037928): June 24, 1975, a perpetual easement was issued to Cascade Natural Gas Corporation for harbor area and beds of navigable water extending directly north of Thompson Drive and Renn Stroll in order to construct a salt water cathodic protection groundbed for protection of a portion of its distribution system in Bremerton.

In vicinity of former Sesko dock

Lent's (harbor area lease 2716) has leased 0.3 acres of Harbor Area fronting Tract 23 and Pennsylvania Avenue of John Daly's Garden Tracts and located in Lot 1, Section 14, T 24 N R 1 E, WM, and W ½ of Pennsylvania Avenue from 1938-1998.

Harbor area lease 1123 was issued to Duncan Clark on January 25, 1938 for harbor area fronting a portion of lot 1, section 14, township 24 north range 1 east between the west line of Tract 23 and the center line of Pennsylvania Avenue of John Daly's Garden Tracts for a ten year term. Harbor area lease 1123 was assigned to Ernest R. Lent, Theodore Blomberg and Harold D. Lent on January 12, 1942. Lease 1393 was issued to Lent's Partnership (Ernest R. Lent, Theodore Blomberg and Harold D. Lent) for a ten year term commencing January 25, 1948. On December 21, 1953, lease 1393 was assigned to Lent's Inc.

Harbor area lease 1675 was issued to Lent's Inc., for a ten year term commencing on January 25, 1958. The lease was for the purpose of "oil barge facilities—dock and pipeline leading to our storage tanks". Lent's Inc. released under lease 2071 for a ten year term commencing on January 25, 1968. Lent's Inc. released under lease 2542 for a ten year term commencing on January 25, 1978.

On December 11, 1979, Theodore and Marian J. Blomberg sold the uplands (a portion of Lot 1, Supplemental Plat of Bayview Garden tracts, and Tract 23 of John Daley's Garden Tracts) to F. Paul and Margaret M. McConkey. The conveyance did not include the first class tidelands (harbor area) in front of the property. It should be noted that the real estate contract was subject to the following easements:

- Easement for sewer pipes — Auditor's file Nos. 301882 and 305863
- Easement for sewer — Auditor's file Nos. 308382 and 353788
- Easement for sewer — Auditor's file No. 585812
- Easement for sewer pipe — Superior Court Cause No. 26012
    - Auditor's file no. 588972
- Deed and perpetual easement — Auditor's file No. 336749

On November 1, 1980, Lent's Inc., by Theodore C. and Marian J. Blomberg as owners of "easements for access, operation, maintenance, installation, removal, repair and servicing of a certain oil dock, and underground oil and gasoline supply lines", transferred those easements to Service Fuel Co., Inc. in conjunction with the transfer of the assets of Lent's Inc. oil department. On March 10, 1981, lease 2452 was assigned to the Service Fuel Co., Inc., owned by James Bennett. On July 6, 1988, James and Dorothea Bennett, as a result of bankruptcy proceedings, quit claimed all interest in the property to the Wilkins Distributing Co., Inc. On January 25, 1988, Wilkins Distributing Company was issued lease 22-002716 for a ten year term for the "purpose of off-loading fuel barges". On November 18, 1996, Wilkins Distributing Company requested that Lease 2716 be terminated.

Harbor Area Lease Chronology:

• Harbor area lease 1123	Duncan J. Clark	January 25, 1938-1948
• Assignment to	E. Lent, H. Lent & T. Blomberg	January 12, 1942
• Harbor area lease 1393	E. Lent, H. Lent & T. Blomberg	January 25, 1948-1958
• Assignment to	Lent's Inc.	December 21, 1953
• Harbor area lease 1675	Lent's Inc.	January 25, 1958-1968
• 22-002071	Lent's Inc.	January 25, 1968-1978
• 22-002452	Lent's Inc.	January 25, 1978-1988
• 22-002716	Wilkins Distributing Co.	January 25, 1988-1998
• Cancelled		November 18, 1996

Former SC Fuels Dock

General Petroleum and its successors leased 0.69 acres of Harbor Area fronting Tract 1 and E ½ of Pennsylvania Avenue, Joseph Daly's Garden Tracts in Lot 1, Section 14, Township 24 North, Range 1 East from 1942 to 1972. This leased harbor area was located immediately adjacent to the Lent's harbor area use. The harbor was used by General Petroleum and Socony Mobil Oil for a thirty year period for handling petroleum products. A 4" pipeline for stove and diesel fuel, and a 4" pipeline for gasoline were placed on the dock to off-load product from barges to a tank farm located upland.

Harbor area lease 1124 was issued to John P. Kuphal for a ten year term commencing on March 18, 1938, for the purpose of mooring small boats and anchorage. On October 14, 1942, the General Petroleum Corporation of California applied to lease the harbor area fronting Tract 1 of John Daly's Garden Tracts for the purpose of constructing a "dock for handling petroleum products." Lease 1124 was assigned from John P. Kuphal to General Petroleum Corporation of California on December 16, 1942. On May 5, 1943, lease 1124 was cancelled and a new lease was issued to General Petroleum Corporation of California for a 10 year term commencing on March 18, 1943. Lease 1507 was issued to General Petroleum Corporation of California for a 10 year term commencing on August 18, 1953.

On January 14, 1960, the General Petroleum Corporation was merged into its parent company Socony Mobil Oil Company, Inc. Lease 22-001920 was issued to Socony Mobil Oil Company for a 10 year term commencing on March 18, 1963. On March 17, 1972 at the request of Mobil Oil Corporation lease 22-001920 was terminated.

Harbor Area Lease Chronology

• Harbor area lease 1124	John P. Kuphal	March 18, 1938-1948
• Assignment to	General Petroleum Co. of Cal.	December 16, 1942
• Lease cancelled		May 5, 1943
• Harbor area lease 1280	General Petroleum Co. of Cal.	March 18, 1943-1953
• Harbor area lease 1507	General Petroleum Co. of Cal.	August 18, 1953-1963
• Name change to	Socony Mobil Oil Company, Inc.	1960
• 22-001920	Socony Mobil Oil Company, Inc.	March 18, 1963-1973
• Lease Cancelled		March 17, 1972

City of Bremerton Sewer

The City of Bremerton has constructed a sewer line that transits in and out of waterway and harbor area fronting both Sections 11 and 14 of Township 24 North Range 1 East. On October 28, 1983, the City of Bremerton was issued an easement (51-045730) for the construction, operation, use and maintenance of a sanitary sewer line.

APPENDIX E

Boring and Well Logs

GAS WORKS BORING LOGS

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	CC	Cement Concrete
	AC	Asphalt Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

Measured groundwater level in exploration, well, or piezometer

Groundwater observed at time of exploration

Perched water observed at time of exploration

Measured free product in well or piezometer

Stratigraphic Contact

Distinct contact between soil strata or geologic units

Gradual change between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

GEOENGINEERS

FIGURE A-1

Date(s) Drilled	05/21/07	Logged By	MSL	Checked By	MSL
Drilling Contractor	Cascade Drilling	Drilling Method	HSA	Sampling Methods	Dames & Moore
Auger Data	4¼-inch ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	CME 75
Total Depth (ft)	46.5	Surface Elevation (ft)	45.03	Groundwater Elevation (ft)	7.03
Vertical Datum		Datum/ System	NAVD88	Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	SAMPLES: Sub-Sample Number	SAMPLES: Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
45	0								AS	Asphalt			
									ML	Brown silt with fine sand and fine gravel (loose, wet) (fill)			
40	5		18	30	1	CA			ML	Brown silt with fine sand (very stiff, moist) (fill)	NS	0.0	
35	10		18	48	2				SM	Brown silty fine to medium sand (very dense, moist)	NS	42.9	
30	15		18	65	3						NS	17.3	
25	20		18	44	4				SM	Brown silty fine to medium sand (very dense, moist)	NS-SS	26.0	
20	25		18	72	5				SP-SM	Brown fine to medium sand with silt (very dense, moist)	NS	42.3	
	30												

Note: See Figure A-1 for explanation of symbols.

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LOG OF MONITORING WELL MW-1

GeoEngineers

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-2
Sheet 1 of 2

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
-15	30		18	65	6						NS	49.4	
-10	35		18	68	7	CA			SM	Brown silty fine sand (very dense, moist)	NS-SS	74.1	
									SP-SM	Brown fine to medium sand with silt (very dense, moist)			
							▼						
-5	40		18	10	8				GM	Brown fine to coarse gravel with well-graded sand and silt (very dense, wet)	SS	21.0	
									GM	Brown silty fine gravel with well graded sand (very dense, wet)			
0	45		18	6	9						NS-SS	23.7	
-5	50												
-10	55												
-15	60												
-20	65												

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LOG OF MONITORING WELL MW-1 (continued)

GEOENGINEERS

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-2
Sheet 2 of 2

Date(s) Drilled	05/21/07	Logged By	MSL	Checked By	MSL
Drilling Contractor	Cascade Drilling	Drilling Method	HSA	Sampling Methods	Dames & Moore
Auger Data	4¼-inch ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	CME 75
Total Depth (ft)	46.5	Surface Elevation (ft)	42.54	Groundwater Elevation (ft)	4.54
Vertical Datum		Datum/ System	NAVD88	Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
	0								AS	Asphalt			
									ML	Gray to brown silt with fine sand and trace gravel (stiff, moist) (fill)			
40													
	5		18	13	1	CA					SS	81.8	Creosote-like odor
35													
									SM	Brown silty fine to medium sand (medium dense, moist) (fill)			
	10		18	15	2						MS	13.6	Black staining; creosote-like odor
									SM	Light brown silty fine sand with trace coarse gravel (medium dense, moist) (fill)			
30													
									SM	Brown silty fine to medium sand (dense, moist)			
	15		18	45	3						NS-SS	9.1	
25													
	20		18	52	4					Becomes very dense	NS	19.4	
20													
	25		18	65	5	CA					NS	18.3	
15													
									GM	Brown well-graded silty gravel with sand (very dense, moist)			
	30												

Note: See Figure A-1 for explanation of symbols.

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LOG OF MONITORING WELL MW-2

GEOENGINEERS

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-3
Sheet 1 of 2

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
	30		10		6						NS	35.2	
10													
									SM	Brown silty fine sand with trace fine gravel (very dense, wet)			
	35		2		7						NS	8.6	
5							▼						
	40		10		8						NS	25.0	
0													
	45		10		9						NS	43.3	
-5													
	50												
-10													
	55												
-15													
	60												
-20													
	65												

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LOG OF MONITORING WELL MW-2 (continued)

GEOENGINEERS

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-3
Sheet 2 of 2

Date(s) Drilled	05/22/07	Logged By	MSL	Checked By	MSL
Drilling Contractor	Cascade Drilling	Drilling Method	HSA	Sampling Methods	Dames & Moore
Auger Data	4¼-inch ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	CME 75
Total Depth (ft)	46.5	Surface Elevation (ft)	39.10	Groundwater Elevation (ft)	4.1
Vertical Datum		Datum/ System	NAVD88	Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
	0								AS	Asphalt			
									SM	Brown silty fine to medium sand with occasional gravel (dense, moist) (fill)			
35													
	5		18	25	1	CA					SS	>2,000	Dark staining creosote-like/solvent odor
									ML	Gray silt with fine sand and occasional gravel (very stiff, moist) (fill)			
30													
	10		18	48	2				SM	Brown silty fine to medium sand (very dense, moist)	SS-NS	469	Dark staining
									MH	Brown silt with fine to medium sand (hard, moist)			
25													
	15		18	45	3				SM	Brown silty fine to medium sand with occasional gravel (very dense, moist)	NS-SS	32.1	
20													
	20		18	52	4						NS	903	
15													
	25		18	62	5	CA			SP-SM	Gray fine to medium sand with silt (very dense, moist)	NS	>2,000	
10									SM	Gray silty fine to medium sand (very dense, moist)			
	30												

Note: See Figure A-1 for explanation of symbols.

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LOG OF MONITORING WELL MW-3

GeoEngineers

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-4
Sheet 1 of 2

Elevation feet	Depth feet	Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
	30		18	63	6						NS	500	
-5	35		18	50/6"	7		▼		ML	Brown sandy silt (very stiff, moist)	NS	872	(very little recovery)
									SP-SM	Gray fine to medium sand with silt (very dense, wet)			
0	40		18	50/4"	8						NS	42.5	
-5	45		ND	50/4"	9						NS	63.0	
-10	50												
-15	55												
-20	60												
-25	65												

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LOG OF MONITORING WELL MW-3 (continued)

GEOENGINEERS

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-4
Sheet 2 of 2

Date(s) Drilled	05/23/07	Logged By	MSL	Checked By	MSL
Drilling Contractor	Cascade Drilling	Drilling Method	HSA	Sampling Methods	Dames & Moore
Auger Data	4¼-inch ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	CME 75
Total Depth (ft)	41.5	Surface Elevation (ft)	35.20	Groundwater Elevation (ft)	6.2
Vertical Datum		Datum/ System	NAVD88	Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
35	0								GM	Brown silty well-graded gravel with well-graded sand (medium dense, moist) (fill)			
30	5		16	18	1						SS	35.9	
25	10		18	18	2						NS-SS	94.9	
									SM	Dark brown to black silty fine to medium sand with gravel (very dense, moist) (fill)			
20	15		18	58	3	CA					HS	76.9	
									ML	Black to gray silt with sand and gravel (very stiff, moist)			
									ML	Brown to gray sandy silt (hard, moist)			
15	20		18	63	4						NS-SS	12.2	
									ML	Gray silt with trace fine sand (hard, moist)			
10	25		18	65	5						NS	128	(diesel odor)
									GM	Gray silty well-graded gravel with well-graded sand (very dense, wet)			
	30												

Note: See Figure A-1 for explanation of symbols.

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LOG OF MONITORING WELL MW-4

GEOENGINEERS

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-5
Sheet 1 of 2

Elevation feet	Depth feet	Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
5	30		ND	50/3"	6	CA					HS	646	(strong gas/diesel odor; product observed on grains)
									SM	Gray silty fine to medium sand (very dense, wet)			
0	35		ND	50/	7						MS	129	
									ML	3 inches gray silt (hard, wet)			
									SP-SM	Gray fine to medium sand with silt (very dense, wet)			
-5	40		ND	50/	8						SS-MS	40.9	
-10	45												
-15	50												
-20	55												
-25	60												
-30	65												

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LOG OF MONITORING WELL MW-4 (continued)

GEOENGINEERS

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-5
Sheet 2 of 2

Date(s) Drilled	05/24/07	Logged By	MSL	Checked By	MSL
Drilling Contractor	Cascade Drilling	Drilling Method	HSA	Sampling Methods	Dames & Moore
Auger Data	4¼-inch ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	CME 75
Total Depth (ft)	21.5	Surface Elevation (ft)	18.51	Groundwater Elevation (ft)	Not Encountered
Vertical Datum		Datum/ System	NAVD88	Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	SAMPLES: Sub-Sample Number	SAMPLES: Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
	0								OL	Organic silt with sand and roots (loose, moist) (topsoil)			
									ML	Brown to dark brown sandy silt with occasional gravel (stiff, moist) (fill)			
15													
	5		18	14	1						SS-NS	1,426	(bricks, roots)
									SM	Brown to black silty fine to coarse sand with gravel (medium dense, moist) (fill)			
10													
	10		18	22	2	CA					NS-SS		(2 inch layer of fill with charcoal pieces)
									GM	Gray to black concrete pieces and fine to coarse gravel with coarse sand and silt (very dense, moist) (fill)			
									SP	Brown fine to medium sand with trace silt (very dense, wet)			
5													
	15		18	50	3						NS		
0									SP	Gray fine to medium sand with trace silt (very dense, wet)			
	20		18	50/3"	4	CA					NS		(faint diesel odor)
-5													
	25												
-10													
	30												

Note: See Figure A-1 for explanation of symbols.

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LOG OF MONITORING WELL MW-5

GEOENGINEERS

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-6
Sheet 1 of 1

Date(s) Drilled	05/22/07	Logged By	MSL	Checked By	MSL
Drilling Contractor	Cascade Drilling	Drilling Method	HSA	Sampling Methods	Dames & Moore
Auger Data	4¼-inch ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	CME 75
Total Depth (ft)	36.5	Surface Elevation (ft)	34.95	Groundwater Elevation (ft)	7.95
Vertical Datum		Datum/ System	NAVD88	Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
	0								AC	Concrete			
									CR	Crushed rock mixed with treated wood			Creosote-like odor and black tar-like substance
									SM	Brown silty fine to medium sand (dense, moist)			
30	5		18	32	1	CA					NS	>2,000	
									ML	Brown sandy silt (very stiff, moist)			
25	10		18	50	2	CA					SS-MS	186	Black staining
									SM	Dark brown to black silty fine to medium sand (very dense, moist)			
20	15		18	50	3						SS-MS	151	Sheen with dark black creosote-like staining
									SM	Brown silty fine to medium sand (very dense, moist)			
15	20		18	50	4						NS-SS	28.0	
									ML	Brown to gray interbedded sandy silt with trace gravel (very stiff, moist)			
									GM	Light brown fine to coarse gravel with silt and sand (very dense, moist)			
10	25		14	50/4"	5						NS-SS	108	(diesel odor)
									ML	Brown sandy silt with gravel (hard, moist)			
							▼						
									SM	Gray fine to medium silty sand (very dense, wet)			
5	30												

Note: See Figure A-1 for explanation of symbols.

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LOG OF MONITORING WELL MW-6

GeoEngineers

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-7
Sheet 1 of 2

DNR-00050247

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
	30		16	76	6						NS-SS	55	(strong gas/diesel odor observed on product grains)
0	35		14	50/4"	7	CA					NS-SS	104.0	
									GM	Gray fine to coarse gravel with sand and silt (very dense, wet)			
-5	40												
-10	45												
-15	50												
-20	55												
-25	60												
-30	65												

V6_ENVBORING W:\SEATTLE\PROJECTS\0\0892017\00\FINALS\089201700.GPJ GEIV6_1.GDT 9/20/07

LOG OF MONITORING WELL MW-6 (continued)

GEOENGINEERS

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-7
Sheet 2 of 2

Date(s) Drilled	05/23/07	Logged By	MSL	Checked By	MSL
Drilling Contractor	Cascade Drilling	Drilling Method	HSA	Sampling Methods	Dames & Moore
Auger Data	4¼-inch ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	CME 75
Total Depth (ft)	36.5	Surface Elevation (ft)	33.24	Groundwater Elevation (ft)	6.24
Vertical Datum		Datum/ System	NAVD88	Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
	0							AS	Asphalt			
								GM	Dark brown silty fine gravel with sand (loose, moist) (fill)			
30												
	5	■	18	21	1	CA				SS	183	(strong odor-coal pieces throughout)
								ML	Brown sandy silt with occasional gravel (stiff, moist)			
								SM	Brown silty fine to medium sand with trace gravel (dense, moist)			
25												
								ML	Brown sandy silt with trace coarse gravel (very stiff, moist) (fill)			
	10	■	8	27	2					NS	15.7	
20												
								SM	Brown silty fine to medium sand with occasional fine gravel (very dense, moist)			
	15	■	18	43	3					SS	601	
15												
	20	■	18	63	4					SS	1,086	
10												
								SP-SM	Gray fine to medium sand with silt (very dense, moist)			
	25	■	18	48	5	CA				HS	328	(very strong diesel odor)
								ML	Brown silt with fine sand (very stiff, moist)			
							▼					
5												
								GM	Brown silty well-graded gravel with sand (very dense, wet)			
	30											

Note: See Figure A-1 for explanation of symbols.

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LOG OF MONITORING WELL MW-7

GeoEngineers

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-8
Sheet 1 of 2

Elevation feet	Depth feet	SAMPLES Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
	30		ND	50/5"	6						NS	50.3	
0													
	35		ND	50/6"	7						NS		
-5													
	40												
-10													
	45												
-15													
	50												
-20													
	55												
-25													
	60												
-30													
	65												

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LOG OF MONITORING WELL MW-7 (continued)

GEOENGINEERS

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-8
Sheet 2 of 2

Date(s) Drilled	05/22/07	Logged By	MSL	Checked By	MSL
Drilling Contractor	Cascade Drilling	Drilling Method	HSA	Sampling Methods	Dames & Moore
Auger Data	4¼-inch ID	Hammer Data	300 lb hammer/30 in drop	Drilling Equipment	CME 75
Total Depth (ft)	41.5	Surface Elevation (ft)	35.56	Groundwater Elevation (ft)	6.56
Vertical Datum		Datum/ System	NAVD88	Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
35	0								OL	Organic top soil (loose, moist)			
									SM	Light brown silty fine to medium sand with gravel (medium dense, moist) (fill)			
30	5		18	11	1				SM	Dark brown silty fine to medium sand with gravel (medium dense, moist) (fill)	SS	4.0	
25	10		18	5	2	CA					SS	10.1	(pieces of charcoal)
20	15		18	16	3						SS	14.7	(pieces of charcoal)
									SM	Brown silty fine to medium sand with gravel (dense, moist) (fill)			
15	20		18	20	4						SS	17.6	
									SM	Brown silty well-graded sand with occasional gravel (very dense, moist)			
10	25		18	70	5	CA					SS	22.0	
									ML	Gray to brown mottled silt with fine sand (hard, moist)			
							▼		GM	Gray silty well-graded gravel with fine to coarse sand (very dense, wet)	NS-SS		
	30												

Note: See Figure A-1 for explanation of symbols.

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LOG OF MONITORING WELL MW-8

GEOENGINEERS

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-9
Sheet 1 of 2

Elevation feet	Depth feet	Interval	Recovered (in)	Blows/foot	Sub-Sample Number	Testing	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppb)	NOTES
5	30		10	50/5"	6						(org)	40.0	(strong gas/diesel odor observed on product grains)
									SP-SM	Gray fine to medium sand with silt (very dense, wet)			
0	35		6	50/4"	7						SS-MS	71.8	
-5	40		6	50/4"	8						SS-MS	105	
-10	45												
-15	50												
-20	55												
-25	60												
-30	65												

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LOG OF MONITORING WELL MW-8 (continued)

GeoEngineers

Project: McConkey/Sesko
Project Location: Bremerton, Washington
Project Number: 0892-017-00

Figure A-9
Sheet 2 of 2

DRILLING LOG OF WELL/BORING NO. MP-01

Project/Location: Bremerton Gas Works / Bremerton, WA
Boring Location: Between welding shop and granite countertop workshop
Date Started/Finished: 5/14/2008 - 5/14/2008
Drilling Contractor: Boart Longyear - John Bennett
Drill Method: Hollow Stem Auger/1.5' splitspoon

Total Depth of Hole (feet BGS): 35
Ground Elevation (feet above N/A):
Inner Casing Elevation (TOC):
Groundwater Depth (feet BGS):
First Encountered: ▽ Final: ▼
Geologist: Courtney Funk

ELEVATION	DEPTH (feet)	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE INTERVAL	PID Readings (PPM)	RECOVERY (feet)	LEL (%)	Blow Counts	COMMENTS
Ground Surface Elevation				*ground surface (gs)*						Reviewed By:
	0–3.5	*No well installed. Borehole was plugged with hydrated sodium-bentonite chips (3/8-inch).*		Auger down to 3.5 feet below ground surface (bgs).		0	0.9			
	3.5–4.0			Dark brown SAND with concrete fragments from blacktop, dry, no odor.		0	0.5			Sample MP01SB05 was collected.
	8.5			Light brown fine to medium SAND, some silt, dry, no odor. Auger down to 8.5 feet bgs.		0	1.5			Sample MP01SB10 was collected.
	13.5			Light brown-grey fine to medium SAND, some large and small gravel, trace silt, dry, no odor. Auger down to 13.5 feet bgs.		0	1.5			Sample MP01SB15 was collected.
	18.5			Light brown-grey fine to medium SAND, dry, no odor. Auger down to 18.5 feet bgs.		0	1.5			Sample MP01SB20 was collected.
	23.5			Light brown-grey fine to medium SAND, dry, no odor. Auger down to 23.5 feet bgs.		0	1.5			Sample MP01SB25 was collected.
	28.5			Light brown-grey fine to medium SAND, some coarse grains, trace silt, moist, no odor. Auger down to 28.5 feet bgs.		0	1.5			Sample MP01SB30 was collected.
	33.5			Grey silty SAND, some small gravel, trace large gravel, moist, no odor. Auger down to 33.5 feet bgs.			1.5			
	34.0			Light brown-grey CLAY, medium plasticity, dry, no odor.						Sample MP01SB35 was collected.
	35.0			Light brown-grey CLAY with reddish brown well graded sand, oxidation present, transitional interval, dry no odor.						
				END boring at 35' - no oil material or odor observed						

PROJECT NAME: Bremerton Gas Works
WELL NO.: MP-01

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DRILLING LOG OF WELL/BORING NO. MP-02

Project/Location:	Bremerton Gas Works / Bremerton, WA	Total Depth of Hole (feet BGS):	30
Boring Location:	West of N. McConkey prop near gate	Ground Elevation (feet above N/A):	
		Inner Casing Elevation (TOC):	
Date Started/Finished:	5/19/2008 - 5/19/2008	Groundwater Depth (feet BGS):	
Drilling Contractor:	Dave Puckett	First Encountered: ∇	Final: ▼
Drill Method:	Hollow Stem Auger/1.5' splitspoon	Geologist:	Courtney Funk

ELEVATION	DEPTH (feet)	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE INTERVAL	PID Readings (PPM)	RECOVERY (feet)	LEL (%)	Blow Counts	COMMENTS Reviewed By:
Ground Surface Elevation				*ground surface (gs)*						
	0–3.5	*No well installed. Borehole was plugged with hydrated sodium-bentonite chips (3/8-inch).*		Auger down to 3.5' bgs			1.5		0	
	3.5–4.0			Dark brown fine SAND, some silt, large and small gravel.						Sample MP02SB05 was collected.
	4.0–8.5			Light brown fine SAND, trace small gravel, dry. Blow counts: 2-5-7. Auger down to 8.5 feet below ground surface.			1.5		0	
	8.5–13.5			Light brown/grey fine to medium SAND, some small gravel, trace large gravel, trace silt, dry, no odor. Blow counts: 3-9-13. Auger down to 13.5 feet bgs.			1.5		0	Sample MP02SB10 was collected.
	13.5–18.5			Light brown/grey fine to medium SAND, trace silt, dry, no odor. Blow counts: 7-19-31. Auger down to 18.5 feet bgs.			1.5		0	Sample MP02SB15 was collected.
	18.5–23.5			Light brown/grey fine to medium SAND, trace silt, dry, no odor. Blow counts: 9-12-22. Auger down to 23.5 feet bgs.			1.5		0	Sample MP02SB20 was collected.
	23.5–28.5			Light brown/grey fine to medium SAND, trace silt, dry, no odor. Blow counts: 9-11-14. Auger down to 28.5 feet bgs.			1.5		0	Sample MP02SB25 was collected.
	28.5–30.0			Light brown/grey fine to medium SAND, trace silt, dry, no odor. Blow counts: 8-18-21.			1.5		0	
							1.5		0	
							1.5		0	Sample MP02SB30 was collected.
	30.0			End boring at 30 feet bgs- no water encountered.						

DRILLING LOG OF WELL/BORING NO. MP-03

Project/Location: Bremerton Gas Works / Bremerton, WA
Boring Location: West of Thomas Avenue, inside fence
Date Started/Finished: 5/19/2008 - 5/19/2008
Drilling Contractor: Dave Puckett
Drill Method: Hollow Stem Auger/1.5' splitspoon

Total Depth of Hole (feet BGS): 20
Ground Elevation (feet above N/A):
Inner Casing Elevation (TOC):
Groundwater Depth (feet BGS):
First Encountered: ▽ 18 Final: ▼
Geologist: Courtney Funk

ELEVATION	DEPTH (feet)	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE INTERVAL	PID Readings (PPM)	RECOVERY (feet)	LEL (%)	Blow Counts	COMMENTS
Ground Surface Elevation				*ground surface (gs)*						Reviewed By:
	0–3.5	*No well installed. Borehole was plugged with hydrated sodium-bentonite chips (3/8-inch).*		Auger down to 3.5 feet below ground surface (bgs).			1.5		0	
	3.5			Light brown grey SILT, some clay, some fine sand, dry, trace very small gravel. Auger down to 8.5 feet bgs. FID: 0.0 Blow counts: 5-6-9			0		0	Sample MP03SB05 was collected.
	8.5			Grey/brown SILT with some clay, trace fine sand, trace small gravel, low plasticity, dry FID: 0.0 Blow counts: 10-16-12			1.5		0	Sample MP03SB10 was collected.
	10.0						0		0	
	16.5			SILT, no recovery, refusal, unable to salvage a sample for SB15, will continue to 18.5 - 20			1.5			
	18 ▽			Light brown/grey sorted fine medium coarse SAND, trace silt, trace gravel, wet, water at 18' bgs FID: 0.0 Blow counts: 5-7-13						Sample MP03SB20 was collected.
	20.0			END of boring at 20' bgs						

PROJECT NAME: Bremerton Gas Works
WELL NO.: MP-03

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WELL_LOG_BREMERTON.GPJ 11-25-08

DRILLING LOG OF WELL/BORING NO. MP-04

Project/Location:	Bremerton Gas Works / Bremerton, WA	Total Depth of Hole (feet BGS):	40
Boring Location:	South of Port Washington Narrows, west of Sesko Prop	Ground Elevation (feet above N/A):	
		Inner Casing Elevation (TOC):	
Date Started/Finished:	5/13/2008 - 5/13/2008	Groundwater Depth (feet BGS):	
Drilling Contractor:	Boart Longyear - John Bennett	First Encountered: ▽ 31	Final: ▼ 31.35
Drill Method:	Hollow Stem Auger/1.5' splitspoon	Geologist:	Courtney Funk

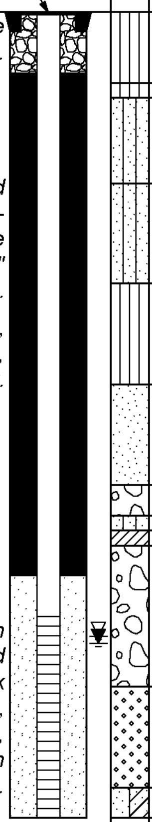
ELEVATION | DEPTH (feet) | WELL COMPLETION DIAGRAM | GRAPHIC LOG | SOIL/ROCK DESCRIPTION | SAMPLE INTERVAL | PID Readings (PPM) | RECOVERY (feet) | LEL (%) | Blow Counts | COMMENTS

COMMENTS: Reviewed By:

Ground Surface Elevation

Heavy Gauged Steel Protective Casing

ground surface (gs)



Well completion diagram:

- *Concrete Cement Base.*
- *Hydrated Sodium-Bentonite Seal with 3/8" Chips.*
- *2.0" ID, Schedule 40, PVC Riser.*
- *20/40 Mesh Silica Sand Filter Pack*
- *2.0" ID, Schedule 40, PVC Screen (0.010" Slots).*

Depth (feet)	Soil/Rock Description
3.5	SILT. Auger down to 3.5 feet below ground surface (bgs).
4.3	Grey sandy SILT, some small gravel, trace clay, dry.
8.5	Light brown fine SAND, some silt, dry, slight odor. Auger down to 8.5 bgs.
13.5	Light brown fine to medium SAND, some silt, dry, no odor. Auger down to 13.5 bgs.
18.5	Light brown and grey SILT, some sand, dry, no odor. Auger down to 18.5 bgs.
23.5	Light brown fine to medium SAND, trace silt, dry, no odor. Auger down to 23.5 bgs.
25.0	GRAVEL. Refusal - no recovery due to a mixture of small and large gravel and cobbles.
25.8	Reddish brown SILT with some sand and some small and large gravel, dry, no odor.
26.5	light brown-grey CLAY, trace silt, dry, no odor, medium plasticity.
33.5	GRAVEL. Refusal - no recovery due to a large amount of cobbles at this interval.
38.5	Grey well graded fine to medium to coarse SAND, trace silt, trace gravel, moist. Auger down to 40 feet bgs.
40.0	Grey well graded fine to medium to coarse SAND, trace silt, trace clay, saturated, no odor
	END boring at 40 feet bgs.

Sample Interval (feet)	Recovery (feet)	Blow Counts	Comments
0–4	1.5	0	Sample MP04SB05 was collected.
4–8	1.5	0	
8–12	1.5	0	Sample MP04SB10 was collected.
12–16	1.5	0	Sample MP04SB15 was collected.
16–20	4	0	Sample MP04SB20 was collected.
20–24	4	0	
24–28	4	0	Sample MP04SB25 was collected.
28–32	1	0	
32–36	1.5	0	Sample MP04SB35 was collected.
36–40	1.5	0	Sample MP04SB45 was collected.

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PROJECT NAME: Bremerton Gas Works
WELL NO.: MP-04

DRILLING LOG OF WELL/BORING NO. SP-01

Project/Location: Bremerton Gas Works / Bremerton, WA	Total Depth of Hole (feet BGS): 20
Boring Location: West of Pennsylvania Avenue, southeast of MW-04	Ground Elevation (feet above N/A):
	Inner Casing Elevation (TOC):
Date Started/Finished: 5/12/2008 - 5/12/2008	Groundwater Depth (feet BGS):
Drilling Contractor: Boart Longyear - John Bennett	First Encountered: ▽ 17 Final: ▼
Drill Method: Hollow Stem Auger/1.5' splitspoon	Geologist: Courtney Funk

ELEVATION	DEPTH (feet)	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE INTERVAL	PID Readings (PPM)	RECOVERY (feet)	LEL (%)	Blow Counts	COMMENTS Reviewed By:
Ground Surface Elevation				ground surface (gs)						
	0–3.5	No well installed. Borehole was plugged with hydrated sodium-bentonite chips (3/8-inch).		SAND. Auger down to 3.5 feet below ground surface (bgs).			1.5			
	3.5–3.8			Light brown and grey well graded SAND, dry, no odor present.						Sample SP01SB05 was collected.
	3.8–4.5			Light brown and grey very fine to fine SAND, some silt, trace gravel (small), dry. FID: 0.0, Blow counts:3-9-13.						
	4.5–8.5			Light brown/grey CLAY medium plasticity, dry. Auger down to 8.5 feet bgs.			0			
	8.5–9.0			Light brown/grey CLAY with predominant red brown sand lenses with oxidation present, trace silt, medium plasticity, dry. FID: 0.0, Blow counts:9-13-15.						Sample SP01SB105 was collected.
	9.0–12			Light brown/grey well graded SAND, dry. Auger down to 13.5 feet bgs.			1.5			

Project/Location: Bremerton Gas Works / Bremerton, WA Total Depth of Hole (feet BGS): 20

Depth (feet)	Graphic Log depth	Soil/Rock Description	PID Readings (PPM)	Recovery (feet)	LEL (%)	Blow Counts	Comments
13.5 – 14.3	13.5	Light brown/grey well graded SAND, wet.		1.5			Sample SP01SB15 was collected.
14.3 – 18.5	14.3	Light brown/grey CLAY with predominant reddish brown sand lenses (fine - medium), trace gravel, wet, low plasticity and oxidation present. FID: 0.0, Blow counts:19-49-57. Auger down to 18.5 feet bgs.					
18.5 – 19.3	18.5	Light brown/grey CLAY with predominant reddish brown sand lenses (fine - medium), wet, low plasticity and oxidation present.		1.5			Sample SP01SB20 was collected.
19.3 – 20.0	19.3	Light brown/grey CLAY, trace sand, wet, medium plasticity, cohensive. FID: 0.0, Blow counts:23-29-47.					
20.0	20.0	End of boring at 20 feet bgs, no water encountered					

Comments: Reviewed By:

Depth scale: 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28

DRILLING LOG OF WELL/BORING NO. SP-02

Project/Location:	Bremerton Gas Works / Bremerton, WA	Total Depth of Hole (feet BGS):	35
Boring Location:	West of Pennsylvania Avenue, northeast of MW-04	Ground Elevation (feet above N/A):	
		Inner Casing Elevation (TOC):	
Date Started/Finished:	5/12/2008 - 5/12/2008	Groundwater Depth (feet BGS):	
Drilling Contractor:	Boart Longyear - John Bennett	First Encountered: ▽ 28.5	Final: ▼ 29.3
Drill Method:	Hollow Stem Auger/1.5' splitspoon	Geologist:	Courtney Funk

ELEVATION	DEPTH (feet)	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE INTERVAL	PID Readings (PPM)	RECOVERY (feet)	LEL (%)	Blow Counts	COMMENTS Reviewed By:
Ground Surface Elevation		Heavy Gauged Steel Protective Casing		ground surface (gs)						
	0–10.0	Concrete Cement Base.		Light brown very fine to fine SAND, some silt, some gravel, root material present, dry. FID:0.0, Blow counts:1-1-1. Auger down to 10 feet below ground surface (bgs).			1.5		0	
							1.5		0	Sample SP02SB05 was collected.
	10.0–12.5	Hydrated Sodium-Bentonite Seal with 3/8" Chips.		Light brown-grey SILT, some sand, some clay, trace gravel, trace brick fragments, dry. FID:0.0, Blow counts:8-11-14.			1.5		0	Sample SP02SB10 was collected.
	12.5–14.0						1.5		0	Sample SP02SB15 was collected.
	14.0–19.0	2.0" ID, Schedule 40, PVC Riser.		Light brown-grey SILT, some sand, some clay, dry. FID:0.0, Blow counts:5-8-19. Auger down to 18.5 feet bgs.			1.5		0	Sample SP02SB20 was collected.
	19.0–23.5			Light brown-grey SILT, some sand, some clay, dry. Grey CLAY, trace silt, dry, medium plasticity. FID:0.0, Blow counts:8-13-50. Auger down to 23.5 feet bgs.			1.5		0	Sample SP02SB25 was collected.
	23.5–28.5	20/40 Mesh Silica Sand Filter Pack		Grey medium to fine SAND, wet, trace brick fragments. FID:0.0, Blow counts:25-44-54. Auger down to 28.5 feet bgs.			~~1.5~~ ~~1.5~~		~~0~~ ~~0~~	Sample SP02SB30 was collected.
	28.5–35.0	2.0" ID, Schedule 40, PVC Screen (0.010" Slots).		Grey medium to fine SAND, wet, no odor, water encountered at 28.5 feet bgs. FID:0.0, Blow counts:23-55. Auger to 35 feet bgs for well installation. no oil material or odors observed.			0		0	
							0		0	
	35.0			END of boring at 35 feet bgs.						

ecology and environment, inc.

PROJECT NAME: Bremerton Gas Works
WELL NO.: SP-02

DRILLING LOG OF WELL/BORING NO. SP-03

Project/Location:	Bremerton Gas Works / Bremerton, WA	Total Depth of Hole (feet BGS):	45
Boring Location:	South of Port Washington Narrows, east of N McConkey Prop	Ground Elevation (feet above N/A):	
		Inner Casing Elevation (TOC):	
Date Started/Finished:	5/12/2008 - 5/12/2008	Groundwater Depth (feet BGS):	
Drilling Contractor:	Boart Longyear - John Bennett	First Encountered: ▽ 41	Final: ▼
Drill Method:	Hollow Stem Auger/1.5' splitspoon	Geologist:	Courtney Funk

Well completion diagram: No well installed. Borehole was plugged with hydrated sodium-bentonite chips (3/8-inch).

Ground Surface Elevation — ground surface (gs)

DEPTH (feet)	SOIL/ROCK DESCRIPTION	RECOVERY (feet)	Blow Counts	COMMENTS (Reviewed By:)
0–4.3	Light brown-grey very fine to fine SAND, some silt, root material, some small gravel, dry.		0	Sample SP03SB05 was collected.
4.3–5.0	Black coated SAND, coal fragments, oil materials, slight odor, dry. FID:138, Blow counts:5-3-2.	0.9	0	
5.0–8.0	Black coated SAND, coal fragments, oil materials, slight odor. FID:25, Blow counts: 50 for 50.			
8.0–13.5	Black coated fine to medium SAND, some silt, wood fragments, coal fragments, large gravel, ash material, trace brick, staurated with oil material, moderate to strong odor. PID:348 ppm, FID:308, blow counts:2-2-2. Auger down to 13.5 feet below ground surface (bgs).	0.5	0	Sample SP03SB10 was collected.
13.5–14.0	Grey very fine to fine SAND, some silt, moist, no visual oil material, slight odor.		0	Sample SP03SB15 was collected.
14.0–18.5	Grey CLAY with reddish brown sand lenses throughout, oxidation present, dry, moderate plasticity. FID:36, blow counts:6-6-6. Auger down to 18.5 feet bgs	1.5	0	
18.5–19.0	Light brown-grey SILT, some clay, trace silt			Sample SP03SB20 was collected.
19.0–19.5	Grey CLAY with reddish brown sand lenses, dry, medium plasticity.			
19.5–23.5	Light brown-grey SILT, some clay, trace sand. FID:0, blow counts:12-16-23. Auger down to 23.5 feet bgs.		0	Sample SP03SB25 was collected.
23.5–	Grey CLAY, some silt, dry, medium			

Project/Location: Bremerton Gas Works / Bremerton, WA Total Depth of Hole (feet BGS): 45

DEPTH (feet)	GRAPHIC LOG depth	SOIL/ROCK DESCRIPTION	RECOVERY (feet)	Blow Counts	COMMENTS
25–28.5		plasticity, slight odor. FID:11 ppm. Auger down to 28.5 feet bgs.	1.5	0	Reviewed By:
28.5–33.5	28.5	Grey CLAY, some silt, dry, medium plasticity. Auger down 33.5 feet bgs. FID:0, blow counts:9-14-18.	1.5	0	Sample SP03SB30 was collected.
33.5–38.5	33.5	Grey CLAY, some silt, dry, medium plasticity, no odor. Auger down 38.5 feet bgs. FID:0, blow counts:9-17-24.	1.5	0	Sample SP03SB35 was collected.
38.5–39.3	38.5	Grey CLAY with some sand, some silt, dry, med/low plasticity	1.5		Sample SP03SB40 was collected.
39.3–43.5	39.3	Grey CLAY, some silt, dry, medium plasticity. Auger down 43.5 feet bgs.			
43.5–45.0	43.5	Dark grey SAND, well graded, wet slight odor, very slight staining. FID:0, Blow counts:23-50-5.			Sample SP03SB45 was collected.
45.0	45.0	END boring at 45 feet bgs.			

PROJECT NAME: Bremerton Gas Works
WELL NO.: SP-03

ecology and environment, inc.

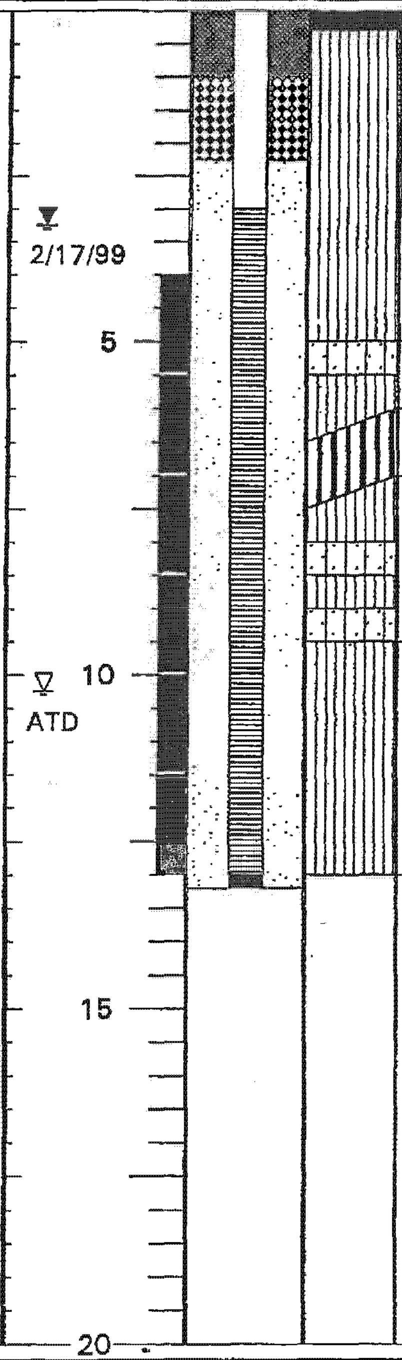
FORMER SC FUELS BORING LOGS

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco	BORING NO.	SC-MW-1
LOCATION	Former Bremerton Bulk Plant No. 1783	PAGE	1 OF 2
DRILLED BY	Cascade Drilling, Inc.	GROUND ELEV.	89.55'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	13.00'
LOGGED BY	Mike Noll	DATE COMPLETED	2/12/99

SAMPLE METHOD AND NUMBER	PID (ppm)	BLOWS PER 6 INCHES
SB-1	190	17-20-23
SB-2	307	10-12-12
SB-3	479	22-26-30
SB-4	27	12-14-15
SB-5	25	16-22-25
SB-6	39	18-25-32

GROUND WATER LEVELS / DEPTH IN FEET / SAMPLES / WELL DETAILS / LITHOLOGIC COLUMN



LITHOLOGIC DESCRIPTION

0 to 0.3 foot: ASPHALT (AS)

0.3 to 5.0 feet: SANDY SILT WITH GRAVEL (ML), brown, becoming olive gray at 2.0 feet, 80 percent low plasticity fines, 10 to 15 percent fine sand, 5 percent fine subrounded gravel, firm to stiff, moist. Some petroleum-like odor.

5.0 to 6.0 feet: SILTY SAND (SM), with SANDY SILT (ML), olive gray, 40 to 60 percent fine sand, 40 to 60 percent low plasticity fines, dense/stiff, moist. Some petroleum-like odor.

6.0 to 7.0 feet: CLAYEY SILT (MH), olive to olive gray, some yellow and brown mottling, 95 to 100 percent medium plasticity fines, firm to stiff, moist. Strong petroleum-like odor.

7.0 to 9.5 feet: SANDY SILT (ML) and SILTY SAND (SM), tan to olive brown, grading to olive gray, 40 to 60 percent fine sand, 40 to 60 percent low plasticity fines, stiff/dense, moist. Strong petroleum-like odor.

9.5 to 13.0 feet: SILT (ML), tan to olive brown becoming gray at 12.0 feet, 95 to 100 percent nonplastic to low plasticity fines, trace fine sand, stiff to very stiff, moist, becoming dry below 12.0 feet. Sheen on sample barrel at 10 to 11.5 feet. No odor below 12.0 feet.

Bottom of boring at 13.0 feet.

See Page 2 for Well Completion Details.

REMARKS

(1) Upper 4.0 feet of boring excavated by hand. (2) SB = Soil samples collected continuously, using 2-inch O.D. split barrel sampler driven with a 200-pound hammer dropped 30-inches. (3) PID = OVM 580B photoionization detector, calibrated to 100 parts per million (ppm) isobutylene. (4) ATD = At Time of Drilling.

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco	BORING NO.	SC- MW-1
LOCATION	Former Bremerton Bulk Plant No. 1783	PAGE	2 OF 2
DRILLED BY	Cascade Drilling, Inc.	GROUND ELEV.	89.55'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	13.00'
LOGGED BY	Mike Noll	DATE COMPLETED	2/12/99

SAMPLE METHOD AND NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
				25				
				30				
				35				
				40				

WELL COMPLETION DETAILS:

0.2 to 3.0 feet: 2-inch-diameter, flush-threaded, Schedule 40, PVC blank casing.

3.0 to 13.0 feet: 2-inch-diameter, flush-threaded, Schedule 40, PVC well screen with 0.010-inch machined slots.

13.0 to 13.2 feet: 2-inch-diameter, Schedule 40, PVC threaded end-cap.

0 to 1.0 foot: concrete.

1.0 to 2.5 feet: bentonite chips hydrated with potable water.

2.5 to 13.0 feet: 20-40 Colorado silica sand.

REMARKS

(1) Upper 4.0 feet of boring excavated by hand. (2) SB = Soil samples collected continuously, using 2-inch O.D. split barrel sampler driven with a 200-pound hammer dropped 30-inches. (3) PID = OVM 580B photoionization detector, calibrated to 100 parts per million (ppm) isobutylene. (4) ATD = At Time of Drilling.

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LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco	BORING NO.	SB-2
LOCATION	Former Bremerton Bulk Plant No. 1783	PAGE	1 OF 2
DRILLED BY	Cascade Drilling, Inc.	GROUND ELEV.	
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	22.00'
LOGGED BY	Mike Noll	DATE COMPLETED	2/12/99

SAMPLE METHOD AND NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
								0 to 5.0 feet: GRAVELLY SILT (ML), and SANDY SILT (ML), olive to olive brown, 80 to 90 percent low plasticity fines, 5 to 10 percent fine to medium sand, 10 to 15 percent fine to medium subrounded gravel, stiff, moist to wet. No odor.
SB-1	2.5	10-30-30						
				5				**5.0 to 14.0 feet: SANDY SILT (ML)**, with thin SILTY SAND (SM) interbeds, olive gray, becoming tan to olive brown with some yellowish mottling below 9.5 feet, 90 to 95 percent low plasticity fines, 5 to 10 percent fine sand, 10 percent fine subangular gravel at 6.0 to 8.0 feet, stiff to very stiff, dry to moist. No odor.
SB-2	1.5	6-4-16						
SB-3	2.5	5-10-12						
SB-4	50	12-15-25						
				10				
SB-5	8	50-50/3"						
SB-6	4.5	50-50/3"						
SB-7	--	45-50/3"						
								14.0 to 22.0 feet: SILT (ML), gray to olive gray, 95 to 100 percent nonplastic to low plasticity fines, trace fine sand, stiff to very stiff, dry to moist. Some laminations and fine beds below 17.0 feet. Faint petroleum-like odor at 18.0 feet.
SB-8	10	40-50/6"		15				
SB-9	2	40-50/5"						
SB-10	1.5	40-50						
SB-11	6.5	55/6"						
				20				

REMARKS

(1) Upper 4.0 feet of boring excavated by hand. (2) SB = Soil samples collected continuously, using 2-inch O.D. split barrel sampler driven with a 200-pound hammer dropped 30-inches. (3) PID = OVM 580B photoionization detector, calibrated to 100 parts per million (ppm) isobutylene. (4) ATD = At Time of Drilling.

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco	BORING NO.	SB-2
LOCATION	Former Bremerton Bulk Plant No. 1783	PAGE	2 OF 2
DRILLED BY	Cascade Drilling, Inc.	GROUND ELEV.	
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	22.00'
LOGGED BY	Mike Noll	DATE COMPLETED	2/12/99

SAMPLE METHOD AND NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
SB-12	4.5	65/4"						**14.0 to 22.0 feet: SILT (ML)**, continued.
								Bottom of boring at 22.0 feet. Boring backfilled with bentonite chips hydrated with potable water.
				25				
				30				
				35				
				40				

REMARKS

(1) Upper 4.0 feet of boring excavated by hand. (2) SB = Soil samples collected continuously, using 2-inch O.D. split barrel sampler driven with a 200-pound hammer dropped 30-inches. (3) PID = OVM 580B photoionization detector, calibrated to 100 parts per million (ppm) isobutylene. (4) ATD = At Time of Drilling.

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LOG OF EXPLORATORY BORING

PROJECT NAME Tosco
LOCATION Former Bremerton Bulk Plant No. 1783
DRILLED BY Cascade Drilling, Inc.
DRILL METHOD Hollow Stem Auger
LOGGED BY Mike Noll

BORING NO. SB-3
PAGE 1 OF 2
GROUND ELEV.
TOTAL DEPTH 20.50'
DATE COMPLETED 2/12/99

SAMPLE METHOD AND NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
								0 to 5.5 feet: SANDY SILT (ML), tan to olive brown, 95 percent low plasticity fines, 5 percent fine sand, firm, moist. No odor.
SB-1	2	17-23-25						
				5				
SB-2	5.5	30-32-36						**5.5 to 8.0 feet: SILTY SAND (SM) and SANDY SILT (ML),** interbeds, olive to olive gray, 50 to 60 percent fine sand, 40 to 50 percent low plasticity fines, medium dense to dense, moist. No odor.
SB-3	4	36-40-45						
SB-4	4	40-42-48						**8.0 to 15.5 feet: SANDY SILT (ML),** olive to olive brown with some brown and yellowish brown mottling, 95 percent nonplastic to low plasticity fines, 5 percent fine sand, stiff to very stiff, dry to moist. No odor.
				10				
SB-5	2.5	40-35-49						
SB-6	5	38-50/6"						
SB-7	8.1	42-50/6"						
SB-8	16	50/5"		15				
SB-9	4	50-50/5"						**15.5 to 16.5 feet: SILTY SAND (SM),** gray, 50 percent fine sand, 50 percent nonplastic to low plasticity fines, very dense, moist. Faint petroleum-like odor.
SB-10	11	50-50/5"						**16.5 to 20.5 feet: SILT (ML),** gray, 95 to 100 percent nonplastic fines, trace to 5 percent fine sand, stiff to very stiff, dry. No odor.
SB-11	2	50-50/4"						
				20				

REMARKS
(1) Upper 4.0 feet of boring excavated by hand. (2) SB = Soil samples collected continuously, using 2-inch O.D. split barrel sampler driven with a 200-pound hammer dropped 30-inches. (3) PID = OVM 580B photoionization detector, calibrated to 100 parts per million (ppm) isobutylene. (4) ATD = At Time of Drilling.

NOLL ENVIRONMENTAL, INC.

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LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco	BORING NO.	SB-3
LOCATION	Former Bremerton Bulk Plant No. 1783	PAGE	2 OF 2
DRILLED BY	Cascade Drilling, Inc.	GROUND ELEV.	
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	20.50'
LOGGED BY	Mike Noll	DATE COMPLETED	2/12/99

SAMPLE METHOD AND NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
								16.5 to 20.5 feet: SILT (ML), continued.
								Bottom of boring at 20.5 feet.
								Boring backfilled with bentonite chips hydrated with potable water.
				25				
				30				
				35				
				40				

REMARKS

(1) Upper 4.0 feet of boring excavated by hand. (2) SB = Soil samples collected continuously, using 2-inch O.D. split barrel sampler driven with a 200-pound hammer dropped 30-inches. (3) PID = OVM 580B photoionization detector, calibrated to 100 parts per million (ppm) isobutylene. (4) ATD = At Time of Drilling.

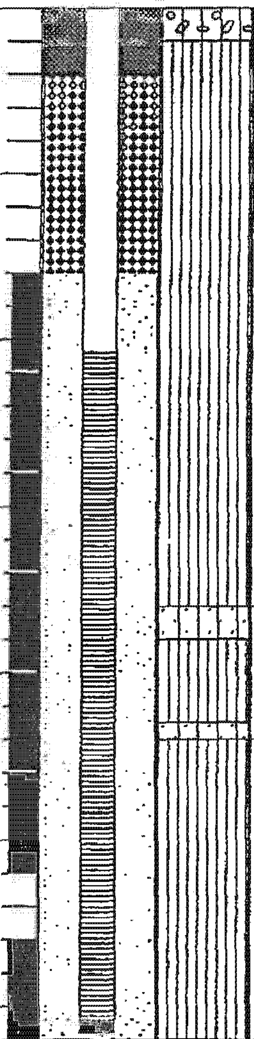
NOLL ENVIRONMENTAL, INC.

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco	BORING NO.	SC-MW-4
LOCATION	Former Bremerton Bulk Plant No. 1783	PAGE	1 OF 2
DRILLED BY	Cascade Drilling, Inc.	GROUND ELEV.	94.73'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	15.50'
LOGGED BY	Mike Noll	DATE COMPLETED	2/12/99

SAMPLE METHOD AND NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET
			2/19/99	
SB-1	288	47-55		
				5
SB-2	655	50-65		
SB-3	666	50-60		
SB-4	665	50-60		
				10
SB-5	38	35-50		
SB-6	30	42-50/5"	ATD	
SB-7	78	50/50/4"		
				15
				20

SAMPLES / WELL DETAILS / LITHOLOGIC COLUMN



LITHOLOGIC DESCRIPTION

0 to 0.5 foot: SILTY GRAVEL (GM), olive gray, 75 to 80 percent fine to medium subangular gravel (crushed rock), 5 to 10 percent fine to coarse sand, 10 to 20 percent low plasticity fines, medium dense, moist. (FILL)

0.5 to 9.0 feet: SANDY SILT (ML), olive to olive gray, some yellowish mottling below 8.0 feet, 85 to 95 percent nonplastic to low plasticity fines, 5 to 15 percent fine sand, stiff, dry to moist. Strong petroleum-like odor.

9.0 to 11.0 feet: SILTY SAND (SM) and SANDY SILT (ML) interbeds, olive to olive gray, 60 percent fine sand, 40 percent low plasticity fines, dense, moist. Some petroleum-like odor.

11.0 to 15.5 feet: SANDY SILT (ML), olive gray to gray, 90 to 95 percent low plasticity fines, 5 to 10 percent fine sand, stiff, wet. Faint petroleum-like odor.

Bottom of boring at 15.5 feet.

See Page 2 for Well Completion Details.

REMARKS

(1) Upper 4.0 feet of boring excavated by hand. (2) SB = Soil samples collected continuously, using 2-inch O.D. split barrel sampler driven with a 200-pound hammer dropped 30-inches. (3) PID = OVM 580B photoionization detector, calibrated to 100 parts per million (ppm) isobutylene. (4) ATD = At Time of Drilling.

NOLL ENVIRONMENTAL, INC.

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco	BORING NO.	SC-MW-4
LOCATION	Former Bremerton Bulk Plant No. 1783	PAGE	2 OF 2
DRILLED BY	Cascade Drilling, Inc.	GROUND ELEV.	94.73'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	15.50'
LOGGED BY	Mike Noll	DATE COMPLETED	2/12/99

SAMPLE METHOD AND NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
								WELL COMPLETION DETAILS: 0.2 to 5.2 feet: 2-inch-diameter, flush-threaded, Schedule 40, PVC blank casing. 5.2 to 15.2 feet: 2-inch-diameter, flush-threaded, Schedule 40, PVC well screen with 0.010-inch machined slots. 15.2 to 15.4 feet: 2-inch-diameter, Schedule 40, PVC threaded end-cap. 0 to 1.0 foot: concrete. 1.0 to 4.0 feet: bentonite chips hydrated with potable water. 4.0 to 15.5 feet: 20-40 Colorado silica sand.
				25				
				30				
				35				
				40				

REMARKS

(1) Upper 4.0 feet of boring excavated by hand. (2) SB = Soil samples collected continuously, using 2-inch O.D. split barrel sampler driven with a 200-pound hammer dropped 30-inches. (3) PID = OVM 580B photoionization detector, calibrated to 100 parts per million (ppm) isobutylene. (4) ATD = At Time of Drilling.

NOLL ENVIRONMENTAL, INC.

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LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco	BORING NO.	SC-MW-5
LOCATION	Former Bremerton Bulk Plant No. 1783	PAGE	1 OF 2
DRILLED BY	Cascade Drilling, Inc.	GROUND ELEV.	94.92'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	16.00'
LOGGED BY	Mike Noll	DATE COMPLETED	2/12/99

SAMPLE METHOD AND NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET
SB-1	0.5	70/6"		
				5
SB-2	0	100/6"		
SB-3	0	50-50/5"		
SB-4	0	60-50/3"	▼ 2/17/99	
SB-5	0.5	50-50/5"		10
SB-6	1	55-50/5"		
SB-7	0.5	50-50/5"		
SB-8		50-50		15
				20

SAMPLES / WELL DETAILS / LITHOLOGIC COLUMN

LITHOLOGIC DESCRIPTION

0 to 5.5 feet: SANDY SILT (ML), olive gray, 85 to 90 percent low plasticity fines, 10 to 15 percent fine sand, trace to 5 percent fine to medium subrounded gravel, stiff, moist. No odor.

5.5 to 11.5 feet: SILTY SAND (SM) and SANDY SILT (ML) interbeds, olive gray to olive brown, some yellowish brown mottling from 6.5 to 11.0 feet, 50 percent fine sand, 50 percent low plasticity fines, dense, moist. No odor.

11.5 to 12.0 feet: SAND (SP), gray, 75 percent fine to medium sand, 5 percent fine subrounded gravel, 5 to 10 percent low plasticity fines, medium dense, wet. No odor.

12.0 to 16.0 feet: SANDY SILT (ML) and some SILTY SAND (SM) interbeds, gray, 80 to 95 percent nonplastic to low plasticity fines, 5 to 20 percent fine sand, stiff to very stiff, moist. No odor.

Bottom of boring at 16.0 feet.

See Page 2 for Well Completion Details.

REMARKS

(1) Upper 4.0 feet of boring excavated by hand. (2) SB = Soil samples collected continuously, using 2-inch O.D. split barrel sampler driven with a 200-pound hammer dropped 30-inches. (3) PID = OVM 580B photoionization detector, calibrated to 100 parts per million (ppm) isobutylene. (4) ATD = At Time of Drilling.

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco	BORING NO.	SC- MW-5
LOCATION	Former Bremerton Bulk Plant No. 1783	PAGE	2 OF 2
DRILLED BY	Cascade Drilling, Inc.	GROUND ELEV.	94.92'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	16.00'
LOGGED BY	Mike Noll	DATE COMPLETED	2/12/99

SAMPLE METHOD AND NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
								WELL COMPLETION DETAILS: 0.2 to 5.2 feet: 2-inch-diameter, flush-threaded, Schedule 40, PVC blank casing. 5.2 to 15.2 feet: 2-inch-diameter, flush-threaded, Schedule 40, PVC well screen with 0.010-inch machined slots. 15.2 to 15.4 feet: 2-inch-diameter, Schedule 40, PVC threaded end-cap. 0 to 1.0 foot: concrete. 1.0 to 4.0 feet: bentonite chips hydrated with potable water. 4.0 to 16.0 feet: 20-40 Colorado silica sand.
				25				
				30				
				35				
				40				

REMARKS

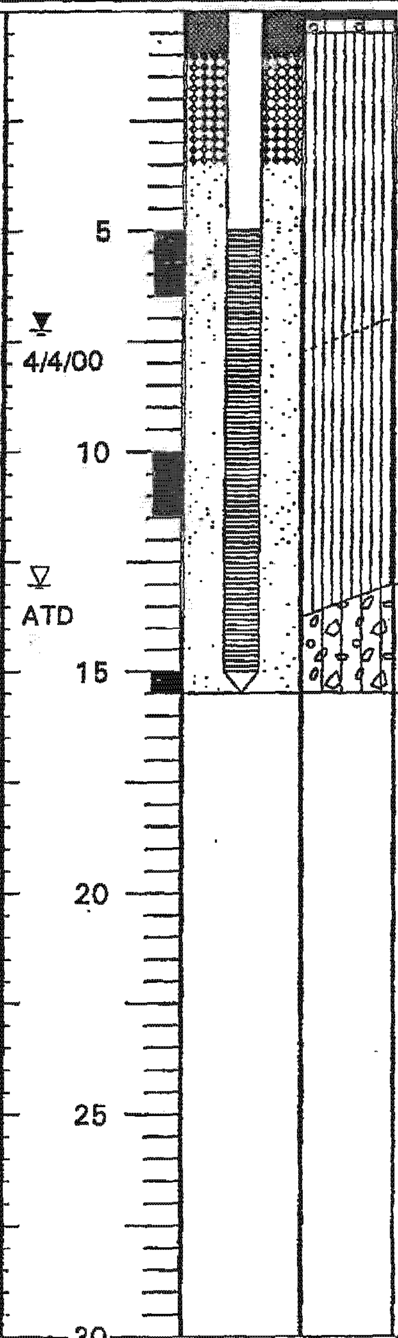
(1) Upper 4.0 feet of boring excavated by hand. (2) SB = Soil samples collected continuously, using 2-inch O.D. split barrel sampler driven with a 200-pound hammer dropped 30-inches. (3) PID = OVM 580B photoionization detector, calibrated to 100 parts per million (ppm) isobutylene. (4) ATD = At Time of Drilling.

NOLL ENVIRONMENTAL, INC.

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco/Former Bremerton Bulk Plant #1783	BORING NO.	SC- MW-6
LOCATION	Bremerton, Washington	PAGE	1 OF 1
DRILLED BY	GeoTech Explorations, Inc.	TOC ELEV.	89.69'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	15.50'
LOGGED BY	Mike Noll	DATE COMPLETED	3/31/00

SAMPLE NUMBER	PID (ppm)	BLOWS PER 6 INCHES
MW6-5.5	0.7	6-7-9 (16)
MW6-10	0	7-8-10 (18)
MW6-15	–	18



LITHOLOGIC DESCRIPTION

0 to 0.2 foot: ASPHALT (AS)

0.2 to 0.5 foot: SILTY GRAVEL (GM), brown, 70 percent fine to medium angular gravel (crushed rock), 30 percent low plasticity fines, medium dense, moist. No odor.

0.5 to 7.0 feet: SANDY SILT WITH GRAVEL (ML), olive gray to gray, some blueish gray staining, 60 to 70 percent low plasticity fines, 20 to 40 percent fine and some medium to coarse sand, 5 to 15 percent fine to medium subrounded gravel, stiff to moderately stiff, moist. Some petroleum-like odor and staining.

7.0 to 13.0 feet: SILT WITH SAND (ML), olive to olive gray, some yellowish orange mottling, 95 percent nonplastic to low plasticity fines, 5 percent fine sand, stiff, moist. No odor.

13.0 to 15.5 feet: SILTY GRAVEL WITH SAND (GM), olive to olive gray, 75 to 80 percent fine to medium and some coarse subangular to subrounded gravel, 15 to 20 percent low plasticity fines, 5 to 10 percent fine to coarse sand, dense, wet. (GLACIAL DRIFT) No odor.

Total depth drilled = 15.5 feet.
Total depth sampled = 15.5 feet.

WELL COMPLETION DETAILS

0 to 5.0 feet: 2-inch diameter, flush-threaded, Schedule 40 PVC blank casing.
5.0 to 15.0 feet: 2-inch diameter, flush-threaded, Schedule 40 PVC well screen with 0.010-inch machined slots.
15.0 to 15.5 feet: 2-inch diameter, flush-threaded, Schedule 40 tapered PVC endcap.

0 to 1.0 foot: concrete.
1.0 to 3.5 feet: bentonite chips hydrated with potable water.
3.5 to 15.5 feet: 10-20 Colorado silica sand.

REMARKS

(1) Soil samples collected using a 2-inch O.D. split spoon sampler driven using a 140-pound hammer dropped 30 inches.
(2) PID = photoionization detector, calibrated to 100 parts per million isobutylene. (3) ATD = At Time of Drilling. (4) TOC = Top of PVC casing. (5) – = Not measured (insufficient sample volume).

NOLL ENVIRONMENTAL, INC.

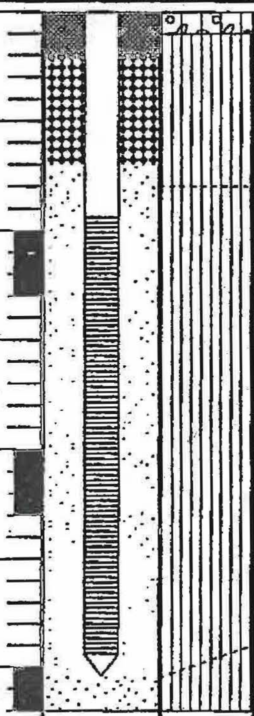
TOSBR.gds:2,04/27/00...TOSBR

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco/Former Bremerton Bulk Plant #1783	BORING NO.	SL- MW-7
LOCATION	Bremerton, Washington	PAGE	1 OF 1
DRILLED BY	GeoTech Explorations, Inc.	TOC ELEV.	90.52'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	16.00'
LOGGED BY	Mike Noll	DATE COMPLETED	3/31/00

SAMPLE NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET
MW7-5.5	0.7	2-5-10 MD		5
			▼ 4/4/00	
MW7-10	0.7	3-8-7 MD		10
MW7-15	--	6-7 MD		15
				20
				25
				30

SAMPLES / WELL DETAILS / LITHOLOGIC COLUMN



LITHOLOGIC DESCRIPTION

0 to 0.5 foot: SILTY GRAVEL (GM), brown, 80 to 85 percent fine to medium and some coarse angular gravel (crushed rock), 5 to 10 percent fine to coarse sand, 10 to 15 percent nonplastic fines, medium dense, dry to moist. No odor.

0.5 to 4.0 feet: SILT WITH GRAVEL (ML), olive, some yellowish mottling, 80 to 90 percent low plasticity fines, 5 to 10 percent fine to medium and some coarse sand, 5 to 10 percent fine to medium subrounded gravel, stiff, dry to moist. No odor. glacial?

4.0 to 14.5 feet: SILT WITH SAND (ML), olive, some yellowish to yellowish orange mottling, 80 to 90 percent nonplastic fines, 10 to 20 percent fine sand, trace to 5 percent fine to medium subangular to subrounded gravel, stiff, dry to moist, some organics at 5 to 7 feet, some thin lenses of fine sand at 10 to 11 feet. No odor.

Qpfn?

14.5 to 16.0 feet: SILT (ML), gray, 95 to 100 percent nonplastic fines, trace to 5 percent fine sand, stiff to very stiff, dry, some thin sandy laminations. Qpfn?

Total depth drilled = 16.0 feet.
Total depth sampled = 16.0 feet.

WELL COMPLETION DETAILS

0 to 4.7 feet: 2-inch diameter, flush-threaded, Schedule 40 PVC blank casing.
4.7 to 14.7 feet: 2-inch diameter, flush-threaded, Schedule 40 PVC well screen with 0.010-inch machined slots.
14.7 to 15.2 feet: 2-inch diameter, flush-threaded, Schedule 40 tapered PVC endcap.

0 to 1.0 foot: concrete.
1.0 to 3.5 feet: bentonite chips hydrated with potable water.
3.5 to 16.0 feet: 10-20 Colorado silica sand.

REMARKS

(1) Soil samples collected using a 2-inch O.D. split spoon sampler driven using a 140-pound hammer dropped 30 inches.
(2) PID = photoionization detector, calibrated to 100 parts per million isobutylene. (3) TOC = Top of PVC casing. (4) -- = Not measured (insufficient sample volume).

NOLL ENVIRONMENTAL, INC.

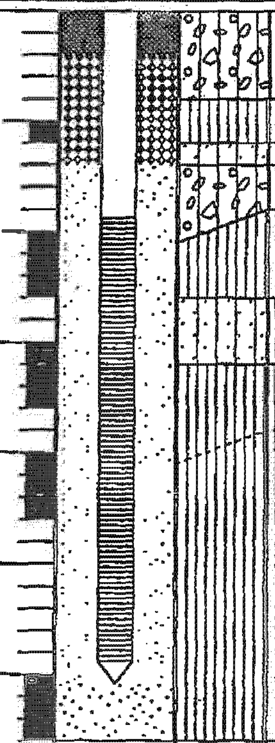
TOSBR.gde:2.04/27/00...TOSBR

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco/Former Bremerton Bulk Plant #1783	BORING NO.	SC MW-8
LOCATION	Bremerton, Washington	PAGE	1 OF 2
DRILLED BY	GeoTech Explorations, Inc.	TOC ELEV.	92.22'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	16.50'
LOGGED BY	Mike Noll	DATE COMPLETED	3/30/00

SAMPLE NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET
MW8-2.5	6.4	GRAB		
NS	–	20-50-47		5
			▽ ATD	
MW8-7.5	0.7	7-9-12 mD	▼ 4/4/00	
MW8-10	0	13-13-15 mD		10
MW8-15	0	8-9-12 mD		15
				20
				25
				30

SAMPLES / WELL DETAILS / LITHOLOGIC COLUMN



LITHOLOGIC DESCRIPTION

0 to 2.0 feet: SILTY GRAVEL (GM), olive brown to brown, 75 percent fine to medium angular gravel (crushed rock), some subrounded gravel, 20 to 25 percent low plasticity fines, trace to 5 percent fine to coarse sand, medium dense, moist. No odor.

2.0 to 3.0 feet: SILT AND CLAYEY SILT (ML), tan, becoming gray with yellowish brown mottling, 80 to 85 percent medium plasticity fines, 5 to 10 percent fine to coarse sand, 5 to 10 percent fine to medium subrounded gravel, stiff, moist. Petroleum-like odor from 2.5 to 3 feet.

3.0 to 3.5 feet: SILTY SAND (SM), gray, 70 percent fine sand, 20 to 25 percent low plasticity fines, 5 to 10 percent fine to medium subrounded gravel, medium dense, moist. Some petroleum-like odor.

3.5 to 4.5 feet: SILTY GRAVEL (GM), gray, 60 to 65 percent fine to medium subrounded gravel, 20 to 30 percent low plasticity fines, 5 to 10 percent fine to coarse sand, dense, moist. Faint petroleum-like odor.

4.5 to 6.5 feet: GRAVELLY SILT (ML), gray to olive, 80 to 85 percent low plasticity fines, 15 to 20 percent fine to medium subrounded gravel, 5 to 10 percent fine to medium sand, stiff, moist to wet. Faint petroleum-like odor.

6.5 to 8.0 feet: SILTY SAND WITH GRAVEL (SM), olive, 50 to 60 percent fine to medium and some coarse sand, 30 to 40 percent low plasticity fines, 5 to 10 percent fine to medium subrounded gravel, dense, moist to wet. No odor.

8.0 to 9.5 feet: GRAVELLY SILT WITH SAND (ML), olive to tan, 90 percent low plasticity fines, 5 to 10 percent fine to medium subrounded gravel, trace sand, stiff, moist. No odor.

9.5 to 16.5 feet: SILT WITH SAND (ML), olive to gray, some yellowish mottling, 95 percent low plasticity to nonplastic fines, trace to 5 percent

REMARKS

(1) Soil samples collected using a 2-inch O.D. split spoon sampler driven using a 140-pound hammer dropped 30 inches.
(2) PID = photoionization detector, calibrated to 100 parts per million isobutylene. (3) ATD = At Time of Drilling. (4) TOC = Top of PVC casing. (5) – = Not measured (insufficient sample volume). (6) NS = No sample recovered. (7) GRAB = Grab soil sample collected from hand auger bucket.

NOLL ENVIRONMENTAL, INC.

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco/Former Bremerton Bulk Plant #1783	BORING NO.	SC- MW-8
LOCATION	Bremerton, Washington	PAGE	2 OF 2
DRILLED BY	GeoTech Explorations, Inc.	TOC ELEV.	92.22'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	16.50'
LOGGED BY	Mike Noll	DATE COMPLETED	3/30/00

SAMPLE NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION
								sand, stiff, dry to moist, some thin laminations at 14 to 16.5 feet. No odor.
								Total depth drilled = 16.5 feet.
								Total depth sampled = 16.5 feet.
				35				**WELL COMPLETION DETAILS**
								0 to 4.7 feet: 2-inch diameter, flush-threaded, Schedule 40 PVC blank casing.
								4.7 to 14.7 feet: 2-inch diameter, flush-threaded, Schedule 40 PVC well screen with 0.010-inch machined slots.
								14.7 to 15.2 feet: 2-inch diameter, flush-threaded, Schedule 40 tapered PVC endcap.
				40				0 to 1.0 foot: concrete.
								1.0 to 3.5 feet: bentonite chips hydrated with potable water.
								3.5 to 16.5 feet: 10-20 Colorado silica sand.
				45				
				50				
				55				
				60				

REMARKS

(1) Soil samples collected using a 2-inch O.D. split spoon sampler driven using a 140-pound hammer dropped 30 inches.
(2) PID = photoionization detector, calibrated to 100 parts per million isobutylene. (3) ATD = At Time of Drilling. (4) TOC = Top of PVC casing. (5) -- = Not measured (insufficient sample volume). (6) NS = No sample recovered. (7) GRAB = Grab soil sample collected from hand auger bucket.

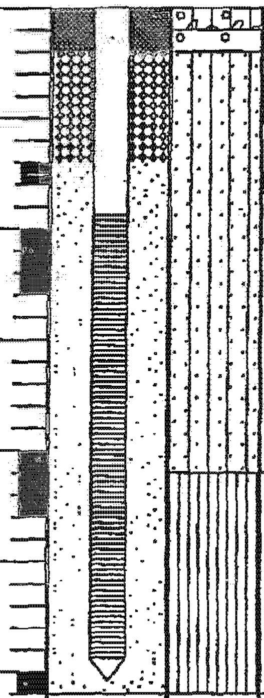
NOLL ENVIRONMENTAL, INC.

LOG OF EXPLORATORY BORING

PROJECT NAME	Tosco/Former Bremerton Bulk Plant #1783	BORING NO.	SC- MW-9
LOCATION	Bremerton, Washington	PAGE	1 OF 1
DRILLED BY	GeoTech Explorations, Inc.	TOC ELEV.	95.55'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	15.50'
LOGGED BY	Mike Noll	DATE COMPLETED	3/30/00

SAMPLE NUMBER	PID (ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET
MW9-3.5	7.8	GRAB	4/4/00	
				5
MW9-5.5	80 422 ft	22-36-50		
MW9-10	0.7	15-21-40	FP 0.5" 11/1/00; ATD	10
MW9-15	--	25		15
				20
				25
				30

SAMPLES | WELL DETAILS | LITHOLOGIC COLUMN



LITHOLOGIC DESCRIPTION

0 to 0.5 foot: SILTY GRAVEL (GM), brown, 80 percent fine to medium angular gravel (crushed rock), 20 percent low plasticity fines, medium dense, moist. No odor.

0.5 to 1.0 foot: SANDY GRAVEL WITH SILT (GP), olive, some yellowish mottling, 70 to 75 percent fine to medium subrounded gravel, 15 to 20 percent fine to coarse sand, 5 to 10 percent nonplastic fines, medium dense, dry to moist. No odor.

1.0 to 10.5 feet: SILTY SAND WITH GRAVEL (SM), gray, 50 to 80 percent fine to medium and some coarse sand, 20 to 30 percent low plasticity fines, trace to 20 percent fine to medium and some coarse subrounded gravel, dense to medium dense, moist. Some fine laminations at 10 feet. Some petroleum-like odor at 5 to 7 feet. No odor at 10 feet.

10.5 to 15.5 feet: SILT (ML), olive with some reddish staining, becoming gray to dark gray, 80 to 95 percent low plasticity to nonplastic fines, 5 to 15 percent fine sand, trace gravel, stiff to very stiff, moist to wet, becoming dry to moist at 15 feet, some fine laminations. No odor.

Total depth drilled = 15.5 feet.
Total depth sampled = 15.5 feet.

WELL COMPLETION DETAILS

0 to 4.7 feet: 2-inch diameter, flush-threaded, Schedule 40 PVC blank casing.
4.7 to 14.7 feet: 2-inch diameter, flush-threaded, Schedule 40 PVC well screen with 0.010-inch machined slots.
14.7 to 15.2 feet: 2-inch diameter, flush-threaded, Schedule 40 tapered PVC endcap.

0 to 1.0 foot: concrete.
1.0 to 3.5 feet: bentonite chips hydrated with potable water.
3.5 to 15.5 feet: 10-20 Colorado silica sand.

REMARKS

(1) Soil samples collected using a 2-inch O.D. split spoon sampler driven using a 140-pound hammer dropped 30 inches.
(2) PID = photoionization detector, calibrated to 100 parts per million isobutylene. (3) ATD = At Time of Drilling. (4) TOC = Top of PVC casing. (5) -- = Not measured (insufficient sample volume). (6) GRAB = Grab soil sample collected from hand auger bucket.

NOLL ENVIRONMENTAL, INC.

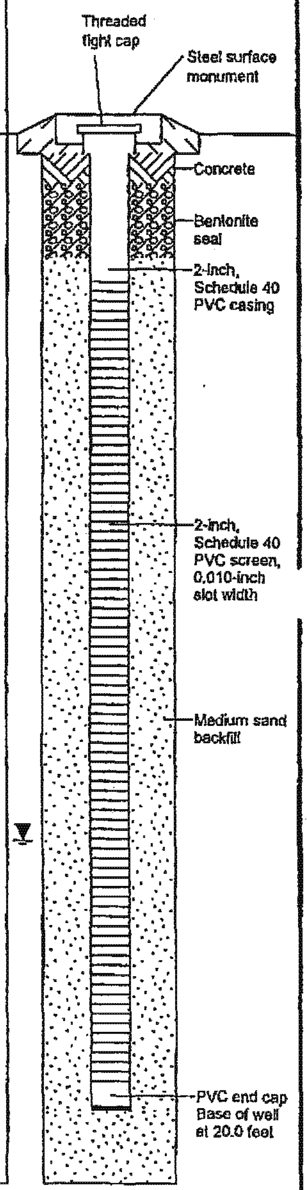
TOSBR.gds:2.04/27/00...TOSBR

DNR-00050277

Date(s) Drilled	12/04/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	Geo-Tech Explorations, Inc.	Drilling Method	Hollow-stem Auger	Sampling Methods	SPT
Total Boring Depth (ft)	21.5	Hammer Data	140 lbs. (lb) hammer/ 30" (in) drop	Drilling Equipment	Geoprobe® Model 5400
Well Depth (ft)	20.0	Top of Well Elevation (ft)		Groundwater Level (ft. bgs)	14.5
System/ Datum	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	Testing	Recovered (in)	Blows/foot	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor TLV(ppm)
	0						AC	Approximately 6 inches asphalt concrete		
							GP-GM	Brown fine to coarse gravel with sand and silt (dense, moist) (fill)	NS	<100
							SM	Brown silty fine to coarse sand with gravel (dense, moist)		
			CA	12	28			fill SM?	SS	<100
	5		CA	4	20			MD	NS	<100
							ML	Brown sandy silt, occasional gravel (stiff, moist)		
				18	15				NS	<100
	10			18	15			Grades to silt with sand	NS	<100
				18	23			Grades to gray very stiff	NS	<100
	15			18	34				NS	<100
				18	25				NS	<100
	20			18	30				NS	<100
								Boring completed at 21.5 feet on 12/04/01 Groundwater encountered at approximately 14.5 feet during drilling		
	25									

WELL CONSTRUCTION



Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using a Bacharach TLV Sniffer.

LOG OF MONITORING WELL SC MW-10

Geo Engineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-20
Sheet 1 of 1

4823-501-01 GEI_ENVWELL_2.1.0 P:\4\4823501\01\FINALS\482350 1B.GPJ GEIV2_2.GDT 10/7/02

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			USCS SYMBOLS GRAPH	USCS SYMBOLS LETTERS	TYPICAL DESCRTIPTIONS
COARSE-GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, WITH LITTLE OR NO FINES CONTENT.
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, WITH LITTLE OR NO-FINES CONTENT.
	MORE THAN 50% OR COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, AND GRAVEL-SAND-SILT MIXTURES.
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, AND GRAVEL-SAND-CLAY MIXTURES.
	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, AND GRAVELLY SANDS, WITH LITTLE OR NO FINES CONTENT.
MORE THAN 50% OF MATERIAL IS LARGER THAN NO.200 SIEVE		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, AND GRAVEL-SAND MIXTURES, WITH LITTLE OR NO FINES CONTENT.
	MORE THAN 50% OR COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, AND SILTY SAND -SILT MIXTURES.
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, AND SAND-CLAY MIXTURES.
FINE-GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, AND LEAN CLAYS.
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO.200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTY SOILS.
				CH	INORGANIC CLAYS OF HIGH PLASTICITY.
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY AND ORGANIC SILTS.
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH NATURAL ORGANIC MATTER CONTENTS.

NOTE: DUAL SYMBOLS (GP/GM) ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

MOISTURE CONTENT

DRY - ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH

DAMP - PERCEPTIBLE MOISTURE, BUT BELOW OPTIMUM MOISTURE CONTENT FOR COMPACTION, NO FREE WATER.

MOIST - PERCEPTIBLE MOISTURE, AT ABOUT OPTIMUM MOISTURE CONTENT FOR COMPACTION. NO FREE WATER.

WET - VISIBLE FREE WATER IN SAMPLE, PROBABLY ABOVE OPTIMUM MOISTURE CONTENT FOR COMPACTION.

ESTIMATED SOIL PERCENTAGES

TRACE - 0 TO 5 %

SLIGHTLY - 5 TO 12 %

NO MODIFIER - (SILTY, SANDY) 12 TO 30 %

VERY - 30 TO 50 %

RELATIVE SOIL DENSITY AND CONSISTENCY

COARSE-GRAINED SOILS

DENSITY	SPT BLOWS PER FOOT
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	GREATER THAN 50

FINE-GRAINED SOILS

CONSISTENCY	SPT BLOWS PER FOOT
VERY SOFT	0 TO 2
SOFT	2 TO 4
MEDIUM STIFF	4 TO 8
STIFF	8 TO 15
VERY STIFF	15 TO 30
HARD	GREATER THAN 30

FIELD MEASUREMENTS

WATER LEVEL OBSERVED DURING DRILLING.

STATIC WATER LEVEL MEASURED AFTER DRILLING.

WATER SEEPAGE

LABORATORY TESTS

M=	MOISTURE CONTENT (%)
D=	DRY DENSITY (PSF)
Tv=	TORVANE
Pp=	POCKET PENETROMETER
GS=	GRAIN SIZE
G2=	% PASSING NO. 200 SIEVE
A=	ATTERBERG LIMITS

WELL CONSTRUCTION

CONCRETE

SOLID SCHEDULE 40 PVC WELL CASING AND BENTONITE SEAL

SOLID SCHEDULE 40 PVC WELL CASING AND SAND FILTER PACK

SLOTTED SCHEDULE 40 PVC WELL SCREEN AND SAND FILTER PACK

BENTONITE

SOIL SAMPLES

SPLIT-SPOON SAMPLE, (2-INCH O.D.) 140 LB. HAMMER (STANDARD SPT)

SPLIT-SPOON SAMPLE, (3-INCH O.D.) 140 OR 300 LB. HAMMER (NON-STANDARD SPT)

DIRECT-PUSH SAMPLE, USING EITHER SPLIT-SPOONS OR ACRYLIC LINERS

GRAB SAMPLE FROM AUGER FLIGHTS OR HAND AUGER

NO SAMPLE RECOVERY

GEOSCIENCE MANAGEMENT, INC.
ENVIRONMENTAL CONSULTING SERVICES
809 156TH STREET NE
ARLINGTON, WA 98223

FIGURE A-1
BORING LOG AND WELL SYMBOL LEGEND
FC FUELS TERMINAL PROPERTY
1702 PENNSYLVANIA AVENUE
BREMERTON, WA

GEOSCIENCE MANAGEMENT, INC.
ENVIRONMENTAL CONSULTING SERVICES
809 156TH STREET NE
ARLINGTON, WA 98223

Geologist: HW Small	Date Began: 6/2/04	Boring No.: SC-MW-4A
Driller: Cascade Drilling	Date End: 6/2/04	Casing Elevation: 94.77
Drill Rig: Limited Access B61	Total Depth: 15.5 Feet	Depth to Water: 11 Feet

Graphic Log	Classification	Soil Description	Depth	Sampled Interval	Blow Counts	Sample Number	PID	Completion
	ML	Hard, damp, gray and oxidized brown, very fine sandy SILT.			50	S-1	3	
			5		20 50	S-2	150	
	SP	Very dense, moist, gray, slightly silty, fine SAND. Moderate petroleum-like odor.						
	ML	Hard, moist, brown, clayey SILT.			50	S-3	5	
			10		50	S-4	20	
	SP	Very dense, wet, gray, very silty, fine sand.			50	S-5	10	
	ML	Hard, wet, brown, slightly clayey SILT.	15		50	S-6	25	

Completion Notes:

Installed 10 feet of 2-inch, 10-slot PVC well screen surrounded by 2-12 silica sand. Hydrated bentonite seal and flush-mounted surface monument.

SITE:
FC Fuels Terminal Investigation
1702 Pennsylvania Avenue
Bremerton, WA

Project No.: 3057.02 | Page: 1

GeoScience Management, Inc.
Environmental Consulting Services
809 156th Street NE
Arlington, WA 98223

Geologist: HW Small	Date Began: 6/2/04	Boring No.: SC-MW-11	
Driller: Cascade Drilling	Date End: 6/2/04	Casing Elevation: 93.60	
Drill Rig: Limited Access B61	Total Depth: 15.5 Feet	Depth to Water: 10 Feet	

Graphic Log	Classification	Soil Description	Depth	Sampled Interval	Blow Counts	Sample Number	PID	Completion
	GP	Gravel Fill						
	ML	Hard, damp to moist, gray and oxidized brown, slightly fine sandy, clayey SILT.			15 25 30	S-1	<1	
			5		15 21 30	S-2	<1	
		Qpf?			50	S-3	<1	
			10		28 50	S-4	<1	
					50	S-5	<1	
	SP	Very dense, wet, gray, very silty, fine SAND.	15		50	S-6	<1	

Completion Notes:

Installed 10 feet of 2-inch, 10-slot PVC well screen surrounded by 2-12 silica sand. Hydrated bentonite seal and flush-mounted surface monument.

SITE:
FC Fuels Terminal Investigation
1702 Pennsylvania Avenue
Bremerton, WA

Project No.: 3057.02 | Page: 1

GeoScience Management, Inc.
Environmental Consulting Services
809 156th Street NE
Arlington, WA 98223

Geologist: HW Small	Date Began: 6/2/04	Boring No.: SC-MW-12	
Driller: Cascade Drilling	Date End: 6/2/04	Casing Elevation: 95.83	
Drill Rig: Limited Access B61	Total Depth: 15.5 Feet	Depth to Water: 7 Feet	

Classification	Soil Description	Depth	Blow Counts	Sample Number	PID
GP	Gravel Fill.				
ML	Hard, damp, gray and oxidized brown, very fine sandy SILT.		50	S-1	<1
SP	Very dense, moist, gray, slightly silty, fine SAND. Moderate petroleum-like odor.	5	50	S-2	<1
ML	Hard, moist, brown, clayey SILT.		50	S-3	10
		10	50	S-4	4
SP	Very dense, wet, gray, very silty, fine sand.		50	S-5	<1
ML	Hard, wet, brown, slightly clayey SILT.	15	50	S-6	<1

Completion Notes:

Installed 10 feet of 2-inch, 10-slot PVC well screen surrounded by 2-12 silica sand. Hydrated bentonite seal and flush-mounted surface monument.

SITE:
FC Fuels Terminal Investigation
1702 Pennsylvania Avenue
Bremerton, WA

Project No.: 3057.02 Page: 1

GeoScience Management, Inc.
Environmental Consulting Services
809 156th Street NE
Arlington, WA 98223

Geologist: HW Small	Date Began: 6/10/04	Boring No.: SC-MW-13	
Driller: Cascade Drilling	Date End: 6/10/04	Casing Elevation: 90.80	
Drill Rig: Limited Access B61	Total Depth: 15.5 Feet	Depth to Water: 9 Feet	

Graphic Log	Classification	Soil Description	Depth	Sampled Interval	Blow Counts	Sample Number	PID	Completion
	GP	Gravel Fill						
	ML	Stiff, damp to moist, tan and oxidized brown, slightly fine sandy, clayey SILT.	5		3 4 5	S-1	<1	
	~~SP~~ SM	Dense, wet, gray-brown, silty, fine SAND, with fine scattered gravels. glacial?	10		11 20 21	S-2	<1	
	ML	Hard, moist to wet, tan and oxidized brown, finely laminated, trace to slightly fine sandy, clayey SILT. Qpfn?	15		50/4	S-3	<1	

Completion Notes:

Installed 10 feet of 2-inch, 10-slot PVC well screen surrounded by 2-12 silica sand. Hydrated bentonite seal and flush-mounted surface monument.

SITE:
FC Fuels Terminal Investigation
1702 Pennsylvania Avenue
Bremerton, WA

Project No.: 3057.02 Page: 1

GEOSCIENCE MANAGEMENT, INC.
ENVIRONMENTAL CONSULTING SERVICES
809 156TH STREET NE
ARLINGTON, WA 98223

Geologist:	HW Small	Date Began:	6/10/04	Boring No.:	SC- MW-14
Driller:	Cascade Drilling	Date End:	6/10/04	Casing Elevation:	89.12
Drill Rig:	Limited Access B61	Total Depth:	15.5 Feet	Depth to Water:	13 Feet

Graphic Log	Classification	Soil Description	Depth	Sampled Interval	Blow Counts	Sample Number	PID	Completion
	GP	Gravel Fill						
	SM	Very dense, damp, light brown, fine SAND.	5		50	S-1	<1	
	ML	Hard, damp to moist, tan and oxidized brown, clayey SILT, with occassional sand interbeds up to 1-inch thick.	10		50	S-2	<1	
			15		50	S-3	<1	

Completion Notes:

Installed 10 feet of 2-inch, 10-slot PVC well screen surrounded by 2-12 silica sand. Hydrated bentonite seal and flush-mounted surface monument.

SITE:
FC Fuels Terminal Investigation
1702 Pennsylvania Avenue
Bremerton, WA

Project No.: 3057.02 Page: 1

GeoScience Management, Inc.
Environmental Consulting Services
809 156th Street NE
Arlington, WA 98223

Geologist: HW Small	Date Began: 6/10/04	Boring No.: SC- MW-15
Driller: Cascade Drilling	Date End: 6/10/04	Casing Elevation: 88.89
Drill Rig: Limited Access B61	Total Depth: 15.5 Feet	Depth to Water: 10 Feet

Graphic Log	Classification	Soil Description	Depth	Sampled Interval	Blow Counts	Sample Number	PID	Completion
	SM	Very dense, damp, light brown, fine SAND.	5		40 50	S-1	<1	
	SP	Very dense, wet, gray, silty fine SAND, trace fine gravels.	10		50/4	S-2	<1	
	ML	Hard, damp to moist, tan and oxidized brown, finely laminated (1/16-inch thick) clayey SILT.	15		50	S-3	<1	

Completion Notes:

Installed 10 feet of 2-inch, 10-slot PVC well screen surrounded by 2-12 silica sand. Hydrated bentonite seal and flush-mounted surface monument.

SITE:
FC Fuels Terminal Investigation
1702 Pennsylvania Avenue
Bremerton, WA

Project No.: 3057.02 | Page: 1

KEY TO ABBREVIATIONS

Drilling Method

HSA - Hollow stem auger
CFA - Continous flight auger
Air - Reverse air circulation

Gravel Pack

CA - Coarse aquarium sand

Sampling Method

SS - Split-spoon sampler (1.5" inner diameter) driven 18" by a 140-pound hammer having a 30" drop. Where penetration resistance is designated "P", sampler was instead pushed by drill rig.
Disturbed - Sample taken from drill-return materials as they surfaced.
Shelby - Shelby Tube thin-walled sampler (3" diameter), where sampler is pushed by drill-rig.

Moisture Content

Dry - Dry
Dp - Damp
Mst - Moist
Wt - Wet

Sorting

PS - Poorly sorted
MS - Moderately sorted
WS - Well sorted

Plasticity

L - Low
M - Moderate
H - High

PID (ppm)

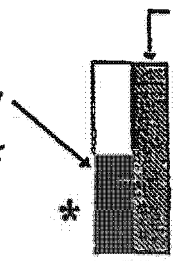
ND - No detection

Symbols

▽ - First encountered ground water

▼ - Static ground water level

* Sample submitted for laboratory analysis



Density (Blows/Foot - Split Spoon Sampler)

Sands and gravels

0 - 4	- Very Loose
4 - 10	- Loose
10 - 30	- Medium dense
30 - 50	- Dense
over 50	- Very dense

Silts and Clays

0 - 2	- Very Soft
2 - 4	- Soft
4 - 8	- Firm
8 - 16	- Stiff
16 - 32	- Very Stiff
32 - 50	- Hard
over 50	- Very Hard

GRAIN - SIZE SCALE

GRADE LIMITS U.S. Standard inch	sieve size		GRADE NAME
			Boulders
12.0			
			Cobbles
3.0	3.0 in.		
			Gravels
0.19	No. 4		
		coarse	
0.08	No. 10		
		medium	Sand
	No. 40		
		fine	
	No. 200		
			Silt
			Clay Size

PACIFIC ENVIRONMENTAL GROUP, INC.

DNR-00050286

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			USCS SYMBOLS GRAPH	USCS SYMBOLS LETTERS	TYPICAL DESCRTIPTIONS
COARSE-GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, WITH LITTLE OR NO FINES CONTENT.
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, WITH LITTLE OR NO-FINES CONTENT.
	MORE THAN 50% OR COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, AND GRAVEL-SAND-SILT MIXTURES.
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, AND GRAVEL-SAND-CLAY MIXTURES.
	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, AND GRAVELLY SANDS, WITH LITTLE OR NO FINES CONTENT.
MORE THAN 50% OF MATERIAL IS LARGER THAN NO.200 SIEVE		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, AND GRAVEL-SAND MIXTURES, WITH LITTLE OR NO FINES CONTENT.
	MORE THAN 50% OR COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, AND SILTY SAND -SILT MIXTURES.
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, AND SAND-CLAY MIXTURES.
FINE-GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, AND LEAN CLAYS.
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTY SOILS.
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO.200 SIEVE				CH	INORGANIC CLAYS OF HIGH PLASTICITY.
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY AND ORGANIC SILTS.
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH NATURAL ORGANIC MATTER CONTENTS.

NOTE: DUAL SYMBOLS (GP/GM) ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

MOISTURE CONTENT

DRY - ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH

DAMP - PERCEPTIBLE MOISTURE, BUT BELOW OPTIMUM MOISTURE CONTENT FOR COMPACTION, NO FREE WATER.

MOIST - PERCEPTIBLE MOISTURE, AT ABOUT OPTIMUM MOISTURE CONTENT FOR COMPACTION, NO FREE WATER.

WET - VISIBLE FREE WATER IN SAMPLE. PROBABLY ABOVE OPTIMUM MOISTURE CONTENT FOR COMPACTION.

ESTIMATED SOIL PERCENTAGES

TRACE - 0 TO 5 %

SLIGHTLY - 5 TO 12 %

NO MODIFIER - (SILTY, SANDY) 12 TO 30 %

VERY - 30 TO 50 %

RELATIVE SOIL DENSITY AND CONSISTENCY

COARSE-GRAINED SOILS

DENSITY	SPT BLOWS PER FOOT
VERY LOOSE	0 TO 4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	GREATER THAN 50

FINE-GRAINED SOILS

CONSISTENCY	SPT BLOWS PER FOOT
VERY SOFT	0 TO 2
SOFT	2 TO 4
MEDIUM STIFF	4 TO 8
STIFF	8 TO 15
VERY STIFF	15 TO 30
HARD	GREATER THAN 30

FIELD MEASUREMENTS

WATER LEVEL OBSERVED DURING DRILLING.

STATIC WATER LEVEL MEASURED AFTER DRILLING.

WATER SEEPAGE

LABORATORY TESTS

M=	MOISTURE CONTENT (%)
D=	DRY DENSITY (PSF)
Tv=	TORVANE
Pp=	POCKET PENETROMETER
GS=	GRAIN SIZE
G2=	% PASSING NO. 200 SIEVE
A=	ATTERBERG LIMITS

WELL CONSTRUCTION

CONCRETE

SOLID SCHEDULE 40 PVC WELL CASING AND BENTONITE SEAL

SOLID SCHEDULE 40 PVC WELL CASING AND SAND FILTER PACK

SLOTTED SCHEDULE 40 PVC WELL SCREEN AND SAND FILTER PACK

BENTONITE

SOIL SAMPLES

SPLIT-SPOON SAMPLE, (2-INCH O.D.) 140 LB. HAMMER (STANDARD SPT)

SPLIT-SPOON SAMPLE, (3-INCH O.D.) 140 OR 300 LB. HAMMER (NON-STANDARD SPT)

DIRECT-PUSH SAMPLE, USING EITHER SPLIT-SPOONS OR ACRYLIC LINERS

GRAB SAMPLE FROM AUGER FLIGHTS OR HAND AUGER

NO SAMPLE RECOVERY

GEOSCIENCE MANAGEMENT, INC.
ENVIRONMENTAL CONSULTING SERVICES
809 156TH STREET NE
ARLINGTON, WA 98223

FIGURE A-1

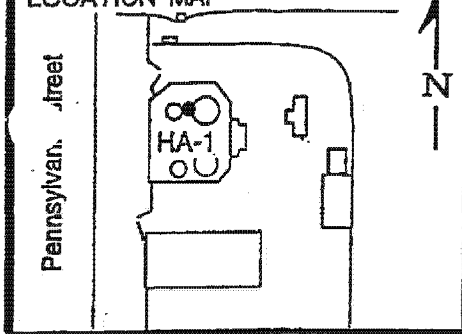
BORING LOG AND WELL SYMBOL LEGEND
FC FUELS TERMINAL PROPERTY
1702 PENNSYLVANIA AVENUE
BREMERTON, WA

Primary Divisions			Group Symbol/Graphic		Typical Names
COARSE GRAINED SOILS more than half is larger than #200 sieve	GRAVELS half of coarse fraction larger than #4 sieve	CLEAN GRAVELS (less than 5% fines)	GW		Well graded gravels, gravel-sand mixtures; little or no fines
			GP		Poorly graded gravels or gravel-sand mixtures; little or no fines
		GRAVEL WITH FINES	GM		Silty gravels, gravel-sand-silt mixtures
			GC		Clayey gravels, gravel-sand-clay mixtures
	SANDS half of coarse fraction smaller than #4 sieve	CLEAN SANDS (less than 5% fines)	SW		Well graded sands, gravelly sands, little or no fines
			SP		Poorly graded sands or gravelly sands; little or no fines
		SANDS WITH FINES	SM		Silty sands, sand-silt mixtures
			SC		Clayey sands, sand-clay mixtures, plastic fines
FINE GRAINED SOILS more than half is smaller than #200 sieve	SILTS AND CLAYS liquid limit less than 50%		ML		Inorganic silts and very fine sand, rock flour, silty or clayey fine sands or clayey silts, with slight plasticity
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL		Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS liquid limit more than 50%		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt		Peat and other highly organic soils

PACIFIC ENVIRONMENTAL GROUP, INC.

Unified Soil Classification System

LOCATION MAP



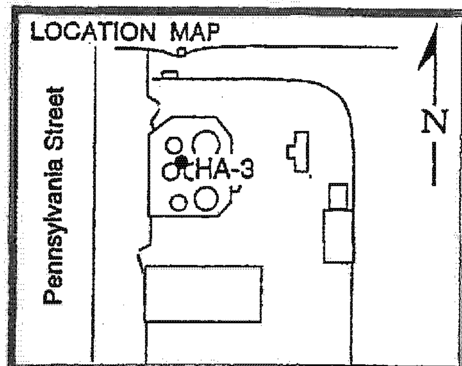
PACIFIC ENVIRONMENTAL GROUP, INC.

BORING NO. HA-1
PAGE 1 OF 1

PROJECT NO. 512-001.1A	CLIENT: TOSCO
LOGGED BY: B.A.	DATE DRILLED: 8-21-97
DRILLER: B.A.	LOCATION: BREMERTON, WA
DRILLING METHOD: HAND AUGER	HOLE DIAMETER: 3.5"
SAMPLING METHOD: HAND AUGER	HOLE DEPTH: 6'
CASING TYPE: NA	WELL DIAMETER: NA
SLOT SIZE: NA	WELL DEPTH: NA
WELL PACK: NA	CASING STICKUP: NA

WELL COMPLETION		MOISTURE CONTENT	PID	PENETRATION (BLOWS/FT)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	GRAPHIC	SOIL TYPE	LITHOLOGY / REMARKS
Backfilled with Cuttings										CONCRETE 1" GRAVEL FILL 6"
		Dry	240		* 1				CL	CLAY: olive gray; low plasticity; 20% fine sand; brown mottling.
					2					
		Dp	30		3					CLAYEY SAND
					4					
		Dp	20		5					
					* 6				SM	SILTY SAND: olive gray; 40% fines; very fine to fine sand.
					7					
					8					BOTTOM OF BORING 6'
					9					
					10					
					11					
					12					
					13					
					14					
					15					
					16					
					17					
					18					
					19					
					20					
					21					
					22					

LOCATION MAP

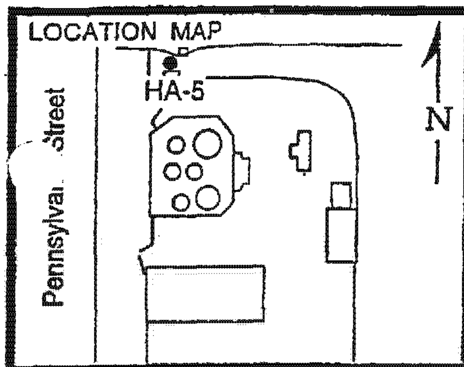


PACIFIC ENVIRONMENTAL GROUP, INC.

BORING NO. HA-3
PAGE 1 OF 1

PROJECT NO. 512-001.1A	CLIENT: TOSCO
LOGGED BY: B.A.	DATE DRILLED: 8-21-97
DRILLER: B.A.	LOCATION: BREMERTON, WA
DRILLING METHOD: HAND AUGER	HOLE DIAMETER: 3.5"
SAMPLING METHOD: HAND AUGER	HOLE DEPTH: 3.2'
CASING TYPE: NA	WELL DIAMETER: NA
SLOT SIZE: NA	WELL DEPTH: NA
WELL PACK: NA	CASING STICKUP: NA

WELL COMPLETION		MOISTURE CONTENT	PID	PENETRATION (BLOWS/FT)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	GRAPHIC	SOIL TYPE	LITHOLOGY / REMARKS
Backfilled with Cuttings										CONCRETE 1" SANDY GRAVEL 5"
		Dp	40		* 1				ML	SILT: brown with gray mottling.
										@1': as above; gray.
					2				SM	SILTY SAND: 50% fines; very fine to fine sand.
			5		3					
										BOTTOM OF BORING 3.2'
					4					
					5					
					6					
					7					
					8					
					9					
					10					
					11					
					12					
					13					
					14					
					15					
					16					
					17					
					18					
					19					
					20					
					21					
					22					



PACIFIC ENVIRONMENTAL GROUP, INC.

BORING NO. HA-5
PAGE 1 OF 1

PROJECT NO. 512-001.1A	CLIENT: TOSCO
LOGGED BY: B.A.	DATE DRILLED: 8-21-97
DRILLER: B.A.	LOCATION: BREMERTON, WA
DRILLING METHOD: HAND AUGER	HOLE DIAMETER: 3.5"
SAMPLING METHOD: HAND AUGER	HOLE DEPTH: 6'
CASING TYPE: NA	WELL DIAMETER: NA
SLOT SIZE: NA	WELL DEPTH: NA
WELL PACK: NA	CASING STICKUP: NA

WELL COMPLETION	MOISTURE CONTENT	PID	PENETRATION (BLOWS/FT)	DEPTH (FEET)	SOIL TYPE	LITHOLOGY / REMARKS
Backfilled with Cuttings	Dry	0		0–3	SM	SILTY SAND: brown; 20% fines.
		112		3–6	SC	CLAYEY SAND: gray; 70% fines; 30% fine sand; roots; trace wood material; sheen.
	Mst	219		* 6		BOTTOM OF BORING 6'

DNR-00050291

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS	GRAVEL More Than 50% of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
More Than 50% Retained on No. 200 Sieve	SAND More Than 50% of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS	SILT AND CLAY Liquid Limit Less Than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
More Than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit 50 or More	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-93.
2. Soil classification using laboratory tests is in general accordance with ASTM D2487-98.
3. Descriptions of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water

Wet - Visible free water or saturated, usually soil is obtained from below water table

GeoEngineers

SOIL CLASSIFICATION SYSTEM

FIGURE A-1

f:\soila-1.doc

Date(s) Drilled	12/06/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	N/A	Drilling Method	N/A	Sampling Methods	Disturbed
Auger Data	N/A	Hammer Data	N/A	Drilling Equipment	Hand Tools
Total Depth (ft)	3.5	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	Testing	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0							CC	Approximately 1.5 inches concrete			
								GP-GM	Brown fine to coarse gravel with sand and silt (dense, moist) (fill)			
				24				SM	Brown silty fine to medium sand with gravel			
			CA							HS	24.2	HA-6-1-3
				6						NS	1.2	
									Boring completed at 3.5 feet because of refusal on 12/06/01 No groundwater encountered			
	5											
	10											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an organic vapor analyzer.

4823-501-01 GEI_ENVBORING_2.1.0 P:\4\4823501\01\FINALS\482350101N.GPJ GEIV2_1.GDT 10/7/02

LOG OF HAND AUGER BORING HA-6

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-3
Sheet 1 of 1

DNR-00050293

Date(s) Drilled	12/06/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	N/A	Drilling Method	N/A	Sampling Methods	Disturbed
Auger Data	N/A	Hammer Data	N/A	Drilling Equipment	Hand Tools
Total Depth (ft)	3	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	SAMPLES: Testing	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0							CC	Approximately 2 inches concrete			
								GP	Brown fine to coarse gravel with sand and silt (dense, moist) (fill)			
				24				SM	Gray silty fine to medium sand with gravel and root debris (fill)			
			CA						Becomes black, apparent staining (heavy petroleum odor)	HS	142	HA-7-1-3
									Boring completed at 3.0 feet because of refusal on 12/06/01 No groundwater encountered			
	5											
	10											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an organic vapor analyzer.

4823-501-01 GEI_ENVBORING 2.1.0 P:\4\4823501\01\FINALS\482350101N.GPJ GEIV2_1.GDT 10/7/02

LOG OF HAND AUGER BORING HA-7

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-4
Sheet 1 of 1

Date(s) Drilled	12/06/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	N/A	Drilling Method	N/A	Sampling Methods	Disturbed
Auger Data	N/A	Hammer Data	N/A	Drilling Equipment	Hand Tools
Total Depth (ft)	3	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	SAMPLES: Testing	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0							CC	Approximately 2 inches concrete			
								GM	Brown fine to coarse silty gravel with sand (dense, moist)			
		X		24				SM	Brown silty fine to medium sand with gravel			
			CA						Color grades to gray	HS	84.6	HA-8-1-3
									Boring completed at 3.0 feet because of refusal on 12/06/01 No groundwater encountered			
	5											
	10											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an organic vapor analyzer.

4823-501-01 GEI ENVBORING 2.1.0 P:\4\4823501\01\FINALS\4823501N.GPJ GEIV2_1.GDT 10/7/02

LOG OF HAND AUGER BORING HA-8

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-5
Sheet 1 of 1

DNR-00050295

Date(s) Drilled	12/06/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	N/A	Drilling Method	N/A	Sampling Methods	Disturbed
Auger Data	N/A	Hammer Data	N/A	Drilling Equipment	Hand Tools
Total Depth (ft)	7	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	6.0
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES Interval	Testing	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0							SM	Brown silty fine to medium sand (medium dense, moist)			
								ML	Brown sandy silt, occasional gravel (soft, moist)			
				24								
										SS	0.2	
				24								
			CA							MS	3.8	HA-9-3-5
	5			24					(mild petroleum odor)			
			CA			▼			Grades to wet	MS	6.4	HA-9-5-7
									Boring completed at 7.0 feet because of hole collapse on 12/06/01 Groundwater encountered at approximately 6.0 feet			
	10											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an organic vapor analyzer.

LOG OF HAND AUGER BORING HA-9

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-6
Sheet 1 of 1

Date(s) Drilled	02/04/02	Logged By	Erik A. Hedberg	Checked By	Marsi M. Beeson
Drilling Contractor	N/A	Drilling Method	Hand Auger	Sampling Methods	Disturbed
Auger Data	N/A	Hammer Data	N/A	Drilling Equipment	Hand Tools
Total Depth (ft)	4	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES Interval	Testing	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0							GM	Brown silty gravel with sand (fill)			
				24				ML	Brown and gray sandy silt with occasional gravel (moist)			
			CA							-	-	HA-10-2-4
									Boring completed at 4.0 feet on 02/04/02 No groundwater encountered			
	5											
	10											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an organic vapor analyzer.

LOG OF HAND AUGER BORING HA-10

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-7
Sheet 1 of 1

Date(s) Drilled	02/04/02	Logged By	Erik A. Hedberg	Checked By	Marsi M. Beeson
Drilling Contractor	N/A	Drilling Method	Hand Auger	Sampling Methods	Disturbed
Auger Data	N/A	Hammer Data	N/A	Drilling Equipment	Hand Tools
Total Depth (ft)	4	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES Interval	Testing	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0							GP	Gravel with sand and brown silt (fill)			
								SP-SM	Brown fine to coarse gravelly sand with silt			
				24				SM	Grayish brown silty sand with occasional gravel (moist)			
			CA							-	-	HA-11-2-4
									Boring completed at 4.0 feet on 02/04/02 No groundwater encountered			
	5											
	10											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an organic vapor analyzer.

4823-501-01 GEI_ENVBORING 2.1.0 P:\4\4823501\01\FINALS\4823501N.GPJ GEIV2_1.GDT 10/7/02

LOG OF HAND AUGER BORING HA-11

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-8
Sheet 1 of 1

Date(s) Drilled	02/04/02	Logged By	Erik A. Hedberg	Checked By	Marsi M. Beeson
Drilling Contractor	N/A	Drilling Method	Hand Auger	Sampling Methods	Disturbed
Auger Data	N/A	Hammer Data	N/A	Drilling Equipment	Hand Tools
Total Depth (ft)	6	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	5.5
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	SAMPLES: Testing	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0							ML	Brown silt with fine to coarse sand and occasional gravel			
									Becomes moist			
									Grades to increasing sand			
	5		CA	12		▼		SM	Gray fine to medium sand with silt (wet)	-	-	HA-12-5-6
									Boring completed at 6.0 feet because of refusal on large object on 02/04/02 Groundwater encountered at approximately 5.5 feet			
	10											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an organic vapor analyzer.

LOG OF HAND AUGER BORING HA-12

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-9
Sheet 1 of 1

4823-501-01 GEI_ENVBORING 2.1.0 P:\4\4823501\01\FINALS\482350IN.GPJ GEIV2_1.GDT 10/7/02

Date(s) Drilled	02/05/02	Logged By	Erik A. Hedberg	Checked By	Marsi M. Beeson
Drilling Contractor	N/A	Drilling Method	Hand Auger	Sampling Methods	Disturbed
Auger Data	N/A	Hammer Data	N/A	Drilling Equipment	Hand Tools
Total Depth (ft)	2.5	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	Testing	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0							CC	2 inches concrete (deteriorated)			
								GM	Brown silty fine to coarse gravel (dense, moist) (fill)			
			CA	18				SM	Brown silty fine to medium sand with gravel	-	-	HA-13-1-2.5
									Boring completed at 2.5 feet because of refusal on large rocks on 02/05/02 No groundwater encountered			
	5											
	10											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an organic vapor analyzer.

LOG OF HAND AUGER BORING HA-13

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-10
Sheet 1 of 1

Date(s) Drilled	12/04/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	Geo-Tech Explorations, Inc.	Drilling Method	Geoprobe® Direct Push	Sampling Methods	Discrete Piston Sampler
Auger Data	Not Applicable	Hammer Data	Hydraulic Percussion	Drilling Equipment	Geoprobe® Model 5400
Total Depth (ft)	16	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	12.0
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	Testing	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor TLV(ppm)	NOTES
	0			46				SM	Brown silty fine to medium sand, occasional gravel (moist)			
										SS	<100	
										NS	<100	
				40								
	5		CA							SS	<100	SP-10-4-6
									Gray staining (no odor)	SS	<100	
				46								
			CA							NS	<100	SP-10-8-10
	10								Encountered sand seam			
										NS	<100	
				48		▼		ML	Brown sandy silt with gravel (wet)			
								SM	Brown silty fine to medium sand, occasional gravel	NS	<100	
	15									NS	<100	
									Boring completed at 16.0 feet on 12/04/01 Groundwater encountered at approximately 12.0 feet during drilling			
	20											
	25											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using a Bacharach TLV Sniffer.

4823-501-01 GEI_ENVBORING 2.1.0 P:\4\4823501\01\FINALS\482350IB.GPJ GEIV2_1.GDT 10/7/02

LOG OF DIRECT-PUSH BORING SP-10

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-11
Sheet 1 of 1

Date(s) Drilled	12/04/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	Geo-Tech Explorations, Inc.	Drilling Method	Geoprobe® Direct Push	Sampling Methods	Discrete Piston Sampler
Auger Data	Not Applicable	Hammer Data	Hydraulic Percussion	Drilling Equipment	Geoprobe® Model 5400
Total Depth (ft)	16	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	11.0
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES Interval	Testing	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor TLV(ppm)	NOTES
	0			46				GM	Brown silty gravel with sand (fill)	SS	<100	
								ML	Brownish gray sandy silt, occasional gravel (medium dense)			
			CA						(moderate petroleum odor)	HS	150	SP-11-2-4
				46								
	5									MS	<100	
									(slight petroleum odor)	MS	<100	
				46								
			CA						(slight petroleum odor)	MS	<100	SP-11-8-10
	10											
						▼				MS	<100	
				48				SM	Brown silty sand, pea gravel (wet)			
										SS	<100	
	15									SS	<100	
									Boring completed at 16.0 feet on 12/04/01 Groundwater encountered at approximately 11.0 feet during drilling			
	20											
	25											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using a Bacharach TLV Sniffer.

4823-501-01 GEI ENVBORING 2.1.0 P:\4\4823501\01\FINALS\482350101B.GPJ GEIV2_1.GDT 10/7/02

LOG OF DIRECT-PUSH BORING SP-11

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-12
Sheet 1 of 1

Date(s) Drilled	12/05/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	Geo-Tech Explorations, Inc.	Drilling Method	Geoprobe® Direct Push	Sampling Methods	Discrete Piston Sampler
Auger Data	Not Applicable	Hammer Data	Hydraulic Percussion	Drilling Equipment	Geoprobe® Model 5400
Total Depth (ft)	16	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	12.5
Datum/ System	Not Determined/Not Determined				

Depth feet	Testing	Recovered (in)	Water Level	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
0		46		GP-GM	Brown fine to coarse gravel with sand and silt (fill)			
				SM	Brown silty fine to medium sand with gravel	SS	1.6	
						SS	2.4	
		48		ML	Brown sandy silt			
5	CA					SS	12.4	SP-12-4-6
					Grades to a silt with sand, occasional gravel			
						SS	6.4	
		48						
						SS	4.4	
10								
	CA				Grades to gray	SS	10.7	SP-12-10-12
		46	▼					
						SS	8.6	
15						SS	4.8	

Boring completed at 16.0 feet on 12/05/01
Groundwater encountered at approximately 12.5 feet during drilling

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an OVA.

4823-501-01 GEI_ENVBORING 2.1.0 P:\4\4823501\01\FINALS\4823501B.GPJ GEIV2_1.GDT 10/7/02

LOG OF DIRECT-PUSH BORING SP-12

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-13
Sheet 1 of 1

Date(s) Drilled	12/04/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	Geo-Tech Explorations, Inc.	Drilling Method	Geoprobe® Direct Push	Sampling Methods	Discrete Piston Sampler
Auger Data	Not Applicable	Hammer Data	Hydraulic Percussion	Drilling Equipment	Geoprobe® Model 5400
Total Depth (ft)	16	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	6.5
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	Testing	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor TLV(ppm)	NOTES
	0			48				GM	Brown silty fine to coarse gravel with sand (fill)			
								SP-SM	Brown fine to coarse sand with gravel and silt (fill)	NS	<100	
								SM	Brown silty fine to medium sand with gravel			
			CA							SS	<100	SP-13-2-4
				46								
	5		CA							SS	<100	SP-13-4-6
						▼		SP-SM	Brown fine to coarse sand with silt, occasional gravel	SS	<100	
				46								
								SM	Brown silty fine to medium sand, occasional gravel	NS	<100	
	10											
										NS	<100	
				48								
										NS	<100	
	15									NS	<100	
								ML	Gray silt with sand (very dense, moist)			
									Boring completed at 16.0 feet on 12/04/01 Groundwater encountered at approximately 6.5 feet during drilling			
	20											
	25											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using a Bacharach TLV Sniffer.

LOG OF DIRECT-PUSH BORING SP-13

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-14
Sheet 1 of 1

Date(s) Drilled	12/04/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	Geo-Tech Explorations, Inc.	Drilling Method	Geoprobe® Direct Push	Sampling Methods	Discrete Piston Sampler
Auger Data	Not Applicable	Hammer Data	Hydraulic Percussion	Drilling Equipment	Geoprobe® Model 5400
Total Depth (ft)	16	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	14.75
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	SAMPLES: Testing	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor TLV(ppm)	NOTES
	0			46				GP	Brownish gray fine to coarse gravel with sand, trace silt (fill)			
								SP-SM	Brown fine to coarse sand with gravel, with silt (fill)	MS	150	
								SM	Brown silty coarse to medium sand with gravel (strong petroleum odor)			
			CA							MS	180	SP-14-2-4
				48					Grades to fine to coarse gravel			
	5									MS	110	
									(strong petroleum odor)			
								ML	Brown fine to coarse sandy silt	HS	123	
				48								
			CA							HS	115	SP-14-8-10
	10								(petroleum odor)			
										HS	<100	
				48								
										MS	<100	
						▼						
	15								Encountered sand and silt seam	SS	<100	
									Boring completed at 16.0 feet on 12/04/01 Groundwater encountered at approximately 14.75 feet during drilling			
	20											
	25											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using a Bacharach TLV Sniffer and OVA.

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LOG OF DIRECT-PUSH BORING SP-14

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-15
Sheet 1 of 1

Date(s) Drilled	12/04/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	Geo-Tech Explorations, Inc.	Drilling Method	Geoprobe® Direct Push	Sampling Methods	Discrete Piston Sampler
Auger Data	Not Applicable	Hammer Data	Hydraulic Percussion	Drilling Equipment	Geoprobe® Model 5400
Total Depth (ft)	16	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	10.0
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	SAMPLES: Testing	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0			46				GP-GM	Brown fine to coarse gravel with sand and silt (moist) (fill)			
								SP-SM	Brown fine to medium sand with gravel and silt (moist) (fill)	NS	0.0	
								SM	Brown silty fine to medium sand with gravel (moist)			
										SS	12.4	
				42								
	5		CA							MS	22.6	SP-15-4-6
								ML	Brown silty fine to medium sand (moist)			
										SS	16.8	
				48								
										SS	24.8	
	10					▼			Grades to wet			
			CA							SS-MS	70.3	SP-15-10-12
				48								
										SS	123	
	15								(moderate petroleum odor)	SS	56.4	
									Boring completed at 16.0 feet on 12/04/01 Groundwater encountered at approximately 10.0 feet during drilling			
	20											
	25											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using a Bacharach TLV Sniffer and OVA.

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LOG OF DIRECT-PUSH BORING SP-15

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-16
Sheet 1 of 1

Date(s) Drilled	12/05/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	Geo-Tech Explorations, Inc.	Drilling Method	Geoprobe® Direct Push	Sampling Methods	Discrete Piston Sampler
Auger Data	Not Applicable	Hammer Data	Hydraulic Percussion	Drilling Equipment	Geoprobe® Model 5400
Total Depth (ft)	16	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	7.5 and 13.0
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES Interval	Testing	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0			42				GW	Brown fine to coarse gravel with sand, trace silt (moist) (fill)			
								SM	Brown silty fine to medium sand with gravel (moist)	SS	0.4	
			CA							SS	0.0	SP-16-2-4
				48								
	5									SS	0.2	
								SP-SM	Brown fine to medium sand, occasional gravel (moist)			
										SS	0.0	
						▼			Encountered silt bed (wet)			
				40								
								SM	Brown silty fine to medium sand with gravel (moist)	SS	0.0	
	10							SP-SM	Brown fine to coarse sand with silt, occasional gravel (moist)			
			CA							SS	1.2	SP-16-10-12
				48								
								SM	Brown silty fine to medium sand, occasional gravel (wet)	NS	0.0	
	15									NS	0.0	
									Boring completed at 16.0 feet on 12/05/01 Groundwater encountered at approximately 7.5 and 13.0 feet during drilling			
	20											
	25											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an OVA.

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LOG OF DIRECT-PUSH BORING SP-16

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-17

Date(s) Drilled	12/05/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	Geo-Tech Explorations, Inc.	Drilling Method	Geoprobe® Direct Push	Sampling Methods	Discrete Piston Sampler
Auger Data	Not Applicable	Hammer Data	Hydraulic Percussion	Drilling Equipment	Geoprobe® Model 5400
Total Depth (ft)	16	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	12.0
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES: Interval	SAMPLES: Testing	SAMPLES: Recovered (in)	SAMPLES: Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0			46				GP-GM	Brown fine to coarse gravel with sand and silt (moist) (fill)			
								SM	Brown silty fine to medium sand, occasional gravel (dense, moist)	SS	0.0	
										SS	0.2	
				48					Gray staining			
	5		CA					ML	Brownish gray silt with sand (soft, moist)	SS	1.2	SP-17-4-6
									Intermittent brown layers to approximately 7.0 feet	SS	0.9	
				42					Grades to brown			
			CA							SS	0.9	SP-17-8-10
	10											
										NS	0.0	
				48		▼			Grades to wet			
										NS	0.0	
	15									NS	0.0	

Boring completed at 16.0 feet on 12/05/01
Groundwater encountered at approximately 12.0 feet during drilling

20

25

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an OVA.

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LOG OF DIRECT-PUSH BORING SP-17

GeoEngineers

Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-18
Sheet 1 of 1

Date(s) Drilled	12/05/01	Logged By	Scott L. McDonald	Checked By	Marsi M. Beeson
Drilling Contractor	Geo-Tech Explorations, Inc.	Drilling Method	Geoprobe® Direct Push	Sampling Methods	Discrete Piston Sampler
Auger Data	Not Applicable	Hammer Data	Hydraulic Percussion	Drilling Equipment	Geoprobe® Model 5400
Total Depth (ft)	16	Surface Elevation (ft)	Not Measured	Groundwater Level (ft. bgs)	10.5
Datum/ System	Not Determined/Not Determined				

Elevation feet	Depth feet	SAMPLES Interval	Testing	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor OVA(ppm)	NOTES
	0			40				GP-GM	Brown fine to coarse gravel with silt and sand (dense, moist) (fill)			
								SP-SM	Brown fine to medium sand with gravel and silt (dense, moist) (fill)	NS	0.0	
			CA	48				SM	Brown silty fine to medium sand, occasional gravel (dense, moist)	NS	0.0	SP-18-2-4
	5									NS	0.0	
								ML	Brown sandy silt, occasional gravel (stiff, moist)	NS	0.0	
			CA	48				SP-SM	Brown fine to coarse sand with silt and gravel (dense, moist)	SS	0.0	SP-18-8-10
	10					▼			Grades to wet			
				48				ML	Gray silt with sand, occasional gravel (very stiff, moist)	SS	0.9	
										SS	1.2	
	15									SS	0.0	
									Boring completed at 16.0 feet on 12/05/01 Groundwater encountered at approximately 10.5 feet during drilling			
	20											
	25											

Note: See Figure A-2 for explanation of symbols
Headspace vapor concentrations taken using an OVA.

LOG OF DIRECT-PUSH BORING SP-18

GeoEngineers

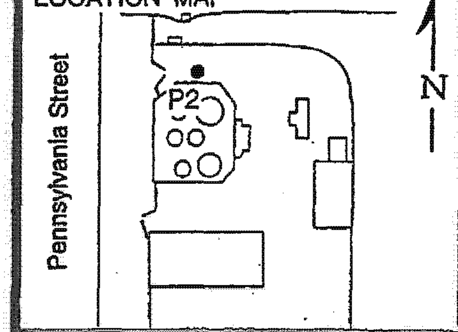
Project: Tosco Corporation
Project Location: Bremerton, Washington
Project Number: 4823-501-01

Figure: A-19
Sheet 1 of 1

4823-501-01 GEI_ENVBORING 2.1.0 P:\4\4823501\01\FINALS\482350118.GPJ GEIV2_1.GDT 10/7/02

DNR-00050309

LOCATION MAP



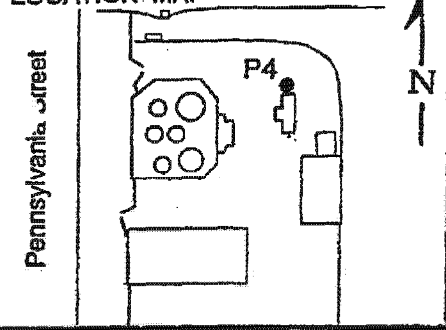
PACIFIC ENVIRONMENTAL GROUP, INC.

BORING NO. P2
PAGE 1 OF 1

PROJECT NO. 512-001.1A	CLIENT: TOSCO
LOGGED BY: M.M.	DATE DRILLED: 8-21-97
DRILLER: VIRONEX	LOCATION: BREMERTON, WA
DRILLING METHOD: GEOPROBE	HOLE DIAMETER: 2"
SAMPLING METHOD: CONT. CORE	HOLE DEPTH: 12'
CASING TYPE: NA	WELL DIAMETER: NA
SLOT SIZE: NA	WELL DEPTH: NA
WELL PACK: NA	CASING STICKUP: NA

WELL COMPLETION	MOISTURE CONTENT	PID	PENETRATION (BLOWS/FT)	DEPTH (FEET)	SOIL TYPE	LITHOLOGY / REMARKS
Concrete				0	GP	GRAVEL SURFACE SANDY GRAVEL FILL
Backfilled with Bentonite	Dry			1		
				2	SC	CLAYEY SAND: olive gray to dark brown; 30 to 40% fines; trace gravel; trace roots; slight hydrocarbon odor.
				3	CL	CLAY: brown to dark gray.
	Dp	136		* 4	SC	CLAYEY SAND: dark gray to olive gray; 30% fines; fine sand; trace iron oxide staining; trace gravel; hydrocarbon odor.
	Wt			5		
				6		
				7		
	Mst	92		8		
				9	CL	CLAY: olive gray; moderate plasticity; 5 to 10% very fine sand; trace gravel; abundant iron oxide staining; no hydrocarbon odor.
	Mst			10		
				11		
	Dp	12		* 12		BOTTOM OF BORING 12'
				13		
				14		
				15		
				16		
				17		
				18		
				19		
				20		
				21		
				22		

LOCATION MAP	PACIFIC ENVIRONMENTAL GROUP, INC.	BORING NO. P4 PAGE 1 OF 1



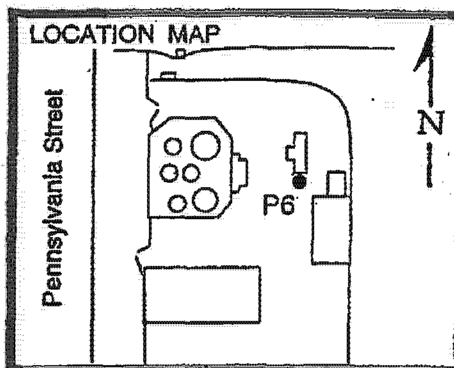
PROJECT NO. 512-001.1A
LOGGED BY: M.M.
DRILLER: VIRONEX
DRILLING METHOD: GEOPROBE
SAMPLING METHOD: CONT. CORE
CASING TYPE: NA
SLOT SIZE: NA
WELL PACK: NA

CLIENT: TOSCO
DATE DRILLED: 8-21-97
LOCATION: BREMERTON, WA
HOLE DIAMETER: 2"
HOLE DEPTH: 14'
WELL DIAMETER: NA
WELL DEPTH: NA
CASING STICKUP: NA

WELL COMPLETION	MOISTURE CONTENT	PID	PENETRATION (BLOWS/FT)	DEPTH (FEET)	SOIL TYPE	LITHOLOGY / REMARKS
Concrete					SC	GRAVEL SURFACE
Backfilled with Bentonite	Dry			1		CLAYEY SAND: fill; brown to olive to dark gray; 20% fines; very fine to fine sand; trace medium to coarse sand; trace gravel; iron oxide staining; no hydrocarbon odor above 3'; slight hydrocarbon odor.
		2		2		
				3		
		3		4		@5': as above; dark gray.
	Dp			5		
				6		
		470		* 7		
	Dp	60		* 8	SC	SANDY CLAY: dark gray; low plasticity; 40% very fine to fine sand; iron oxide staining; hydrocarbon odor.
				9		
				10		
		402		11		@11': clay; olive; to dark gray; silty; interbedded sand lenses; iron oxide staining; hydrocarbon odor.
	Dp					
				12	ML	SILT: olive gray; clayey; low plasticity; trace very fine sand; iron oxide staining; no hydrocarbon odor.
				13		
	Wt	3		* 14		BOTTOM OF BORING 14'
				15		
				16		
				17		
				18		
				19		
				20		
				21		
				22		

DNR-00050311

LOCATION MAP



PACIFIC ENVIRONMENTAL GROUP, INC.

BORING NO. P6
PAGE 1 OF 1

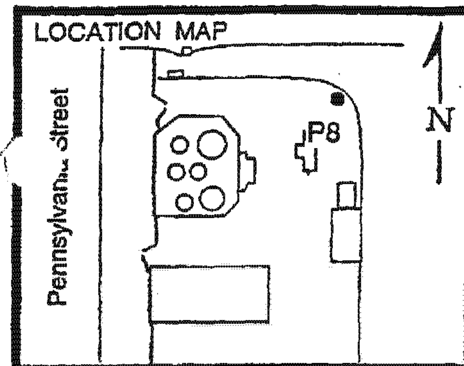
PROJECT NO. 512-001.1A
LOGGED BY: M.M.
DRILLER: VIRONEX
DRILLING METHOD: GEOPROBE
SAMPLING METHOD: CONT. CORE
CASING TYPE: NA
SLOT SIZE: NA
WELL PACK: NA

CLIENT: TOSCO
DATE DRILLED: 8-21-97
LOCATION: BREMERTON, WA
HOLE DIAMETER: 2"
HOLE DEPTH: 10'
WELL DIAMETER: NA
WELL DEPTH: NA
CASING STICKUP: NA

WELL COMPLETION	MOISTURE CONTENT	PID	PENETRATION (BLOWS/FT)	DEPTH (FEET)	SOIL TYPE	LITHOLOGY / REMARKS
Concrete				0		GRAVEL
Backfilled with Bentonite				1	SC	CLAYEY SAND: fill; olive gray; 20 to 30% fines; very fine sand; 5% fine to coarse sand; trace gravel; trace iron oxide staining; no hydrocarbon odor.
	Dp	283		* 4		
	Dp	55		7	CL	CLAY: olive gray; low plasticity; 10% very fine sand; trace fine to coarse sand; trace gravel; iron oxide staining; no hydrocarbon odor.
	Dp	9		* 10		@10': interbedded clayey sand lenses; slight hydrocarbon odor.
						BOTTOM OF BORING 10'

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22

LOCATION MAP	PACIFIC ENVIRONMENTAL GROUP, INC.	BORING NO. P8 PAGE 1 OF 1



PROJECT NO. 512-001.1A	CLIENT: TOSCO
LOGGED BY: M.M.	DATE DRILLED: 8-21-97
DRILLER: VIRONEX	LOCATION: BREMERTON, WA
DRILLING METHOD: GEOPROBE	HOLE DIAMETER: 2"
SAMPLING METHOD: CONT. CORE	HOLE DEPTH: 11'
CASING TYPE: NA	WELL DIAMETER: NA
SLOT SIZE: NA	WELL DEPTH: NA
WELL PACK: NA	CASING STICKUP: NA

WELL COMPLETION		MOISTURE CONTENT	PID	PENETRATION (BLOWS/FT)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	GRAPHIC	SOIL TYPE	LITHOLOGY / REMARKS
Concrete									SC	GRAVEL SURFACE CLAYEY SAND: fill; olive gray; 20% fines; very fine to fine sand; trace to 5% medium to coarse sand; trace gravel; no hydrocarbon odor.
Backfilled with Bentonite					1					
					2					
					3				CL	CLAY: olive gray; low plasticity; trace very fine sand; iron oxide staining; no hydrocarbon odor.
		Dp	0		4					
					5					
					6				SC	CLAYEY SAND: olive gray; 30% fines; very fine sand; trace fine to coarse sand; iron oxide staining; no hydrocarbon odor.
		Dp	0		* 7					
					8				CL	CLAY: olive gray; low plasticity; 10% very fine sand; abundant iron oxide staining; no hydrocarbon odor.
					9					
					10					
		Mst	0		11					
					12					BOTTOM OF BORING 11'
					13					
					14					
					15					
					16					
					17					
					18					
					19					
					20					
					21					
					22					

REGIONAL BORING LOGS

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

34/01-10 L

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No

Permit No.

(1) OWNER: Name Susan Francis Address 9810 15'7 ST N.W.

(2) LOCATION OF WELL: County Kitsap NE ¼ SW ¼ Sec. 10 T. 24 N., R. 1E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 60 ft. Depth of completed well 60 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 0 ft. to 60 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name Sta-Rite
Type: Sub HP 1

(8) WATER LEVELS: Land-surface elevation above mean sea level 100 ft.
Static level 30 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test 16 gal./min. with 20 ft. drawdown after 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Hard pan	0	10
Gravel Brown Clay	10	22
Hard pan	22	40
Blue Sand and water	40	46
Pea gravel and Sand, Rock	46	60

Work started 7-28, 1980 Completed 8-1, 1980

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Minter Creek Drilling (Person, firm, or corporation) (Type or print)

Address 14481 Clayton RD. Port Orchard wash 98[illegible]

[Signed] Earl [illegible]

License No 1098 Date 8-1, 1980

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

DNR-00050315

24/01-11G

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....

Permit No. ....

(1) OWNER: Name DANIEL R SMITH Address 100 Sheridan Rd. #408 Bremerton

(2) LOCATION OF WELL: County KITSAP — SW ¼ NE ¼ Sec. 11 T. 24 N., R. 1E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☑ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 86 ft. Depth of completed well 86 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from +1 ft. to 86 ft.
Threaded ☐ ....." Diam. from ..... ft. to ..... ft.
Welded ☑ ....." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☑
Type of perforator used
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☑
Manufacturer's Name
Type ..... Model No.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☑ Size of gravel:
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☑ No ☐ To what depth? 21 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☑
Type of water? ..... Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: ..... H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level..... ft.
Static level 51 ft. below top of well Date
Artesian pressure ..... lbs. per square inch Date
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test 12 gal./min. with 3 ft. drawdown after 2 hrs.
Artesian flow ..... g.p.m. Date
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☑

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top soil	0	2
BROWN SAND & GRAVEL	2	6
BROWN SAND-GRAVEL & CLAY	6	41
ROCKS	41	43
BROWN SAND-GRAVEL & CLAY	43	49
ROCKS	49	53
BROWN SAND-GRAVEL & CLAY	53	79
BROWN SAND & GRAVEL with water	79	86
BROWN SAND-GRAVEL-CLAY	86	

Work started 9/9, 1982. Completed 9/10, 1982.

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Rath Drilling Co.
(Person, firm, or corporation) (Type or print)

Address 2417 E 3rd Bremerton

[Signed] E. [illegible]
(Well Driller)

License No. 0443 Date ....., 19...

RECEIVED DEC 18 1985 DEPARTMENT OF ECOLOGY NORTHWEST REGION

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Washington State Department of Transportation

367430

LOG OF TEST BORING

24-1E-11J

Start Card R-77288

HOLE No. H-1p-10

Sheet 1 of 3

Job No. OL-2829 SR 303 Elevation ft

Project Manette Bridge 303/4A Replacement

Driller Haller, Robert R.H. Lic# 2779

Site Address Vicinity of Wheaton Way (SR-303) and Harkins St.

Inspector Fetterly, Jamie #2507 JCF

Start February 19, 2010 Completion February 19, 2010 Well ID# BBN-917

Equipment CME 45 (9C4-3) - AH

Station Offset Hole Dia (inches) 5 Method Wet Rotary

Northing Easting Collected by HQ Geotech Division Datum

County Kitsap Subsection NE1/4 of SE1/4 Section 11 Range 1 EWM Township 24 N

Legend: ◆ Field SPT (N); ✚ Moisture Content; ▨ RQD (scale 20, 40, 60, 80)

Depth (ft)	Blows/6" (N) and/or RQD FF	Sample No. (Tube No.)	Description of Material
4–5.5	3, 2, 3, 5, (5)	D-1	Well graded SAND with gravel, stratified with silty sand, loose, brown, moist, stratified, HCl not tested. Length Recovered:0.7 ft. Length Retained:0.7 ft.
6.5–8	7, 10, 12, 15, (22)	D-2	Silty SAND, medium dense, yellowish brown, moist, homogenous, HCl not tested. Length Recovered:1.7 ft. Length Retained:1.7 ft.
9–10.5	8, 11, 15, 22, (26)	D-3	Silty SAND, dense, olive gray, moist, homogenous, HCl not tested. Length Recovered:1.7 ft. Length Retained:1.7 ft.
11–12.5	11, 15, 17, 18, (32)	D-4	Silty SAND, with trace gravel, dense, olive gray, wet, homogenous, HCl not tested. Length Recovered:1.7 ft. Length Retained:1.7 ft. gravel contact
14–15	>> 25, 50/5" (REF)	D-5	Silty GRAVEL with sand, sub-rounded, very dense, olive gray, wet, homogenous, HCl not tested. Length Recovered:0.9 ft. Length Retained:0.9 ft.
16.5–17	>> 50/5" (REF)	D-6	Silty GRAVEL with sand, sub-rounded, very dense, olive gray, wet, homogenous, HCl not tested. Length Recovered:0.4 ft. Length Retained:0.4 ft.
19–20	>> 32, 50/5"	D-7	Silty SAND with gravel, very dense, gray, moist, homogenous, HCl not tested.

Depth (ft): 5, 10, 15, 20

11 J

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card R-77288

HOLE No. H-1p-10

Job No. OL-2829 SR 303 Elevation ft

Sheet 2 of 3

Project Manette Bridge 303/4A Replacement

Driller Haller, Robert Lic# 2779

Legend: ◆ Field SPT (N) ✚ Moisture Content ▨ RQD (scale 20 40 60 80)

Depth (ft)	Elevation (ft)	Field SPT (N)	Blows/6" (N) and/or RQD FF	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater
			(REF)			Length Recovered:0.9 ft. Length Retained:0.9 ft.	
		>>	3250/5" (REF)	D-8		Silty SAND, very dense, gray, moist, homogenous, HCl not tested. Length Recovered:0.9 ft. Length Retained:0.9 ft.	
25			26 43 50 (93)	D-9		Silty SAND, very dense, gray, moist, homogenous, HCl not tested. Length Recovered:1.5 ft. Length Retained:1.5 ft. 2/19/2010	∇
						major gravel contact	
30		>>	50/3" (REF)	D-10		No Recovery	
35		>>	33 "50/3" (REF)	D-11		Silty SAND with gravel, very dense, gray, wet, homogenous, HCl not tested. Length Recovered:0.8 ft. Length Retained:0.8 ft.	
40		>>	50/5" (REF)	D-12		Silty SAND with gravel, very dense, gray, moist, homogenous, HCl not tested. Length Recovered:0.2 ft. Length Retained:0.2 ft.	
45		>>	50/3" (REF)	D-13		Silty GRAVEL with sand, sub-rounded, very dense, gray, wet, homogenous, HCl not tested.	

SOIL A OL-2829 MANETTE BR 303_4A REPL.GPJ SOIL.GDT 2/22/10

Washington State
Department of Transportation

LOG OF TEST BORING

Start Card R-77288

HOLE No H-1p-10

Sheet 3 of 3

Job No OL-2829 SR 303 Elevation ft

Project Manette Bridge 303/4A Replacement

Driller Haller, Robert Lic# 2779

Depth (ft)	Elevation (ft)	Profile	Field SPT (N) / Moisture Content / RQD (20 40 60 80)	Blows/6" (N) and/or RQD FF	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
								Length Recovered:0.3 ft. Length Retained:0.3 ft.		
			>>	50/5" (REF)		D-14		Silty GRAVEL with sand, sub-rounded, very dense, gray, wet, homogenous, HCl not tested. Length Recovered:0.2 ft. Length Retained:0.2 ft.		
50								A standpipe monument was installed on this boring.		
55								The implied accuracy of the borehole location information displayed on this boring log is typically sub-meter in (X,Y) when collected by the HQ Geotech Division and sub-centimeter in (X,Y,Z) when collected by the Region Survey Crew.")		
								End of test hole boring at 49.4 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data. Note: REF = SPT Refusal		
60										
								Bail/Recharge test: Hole Diameter: 5 Depth of boring during bail test: 49.4' Depth of casing during bail test: 49' Bailed bore hole water level to 43.9' Recharge after 1 minutes :43' Recharge after 2 minutes :41.6' Recharge after 3 minutes :40.5' Recharge after 4 minutes :39' Recharge after 5 minutes :37.8' Recharge after 10 minutes :33.7'		
65										
70										

SOILA OL-2829 MANETTE BR 303_4A REPL.GPJ SOIL.GDT 2/22/10

24-1E-11J

Please print, sign and return to the Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. S30321

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

321369

Construction/Decommission *("x" in box)*
- [x] Construction
- [ ] Decommission

Type of Well *("x in box)*
- [ ] Resource Protection
- [x] Geotech Soil Boring

ORIGINAL INSTALLATION Notice of Intent Number:

Consulting Firm: Landan Assoc.

Unique Ecology Well IDTag No.:

Property Owner: CPA Properties

Site Address: 523 Lebo Blvd

City: Bremerton County: KITSAP

Location: NE 1/4-1/4 SE 1/4 Sec 11 Twn 24N R 1

EWM [x] or WWM [ ]

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Min ____ Sec ____
Long Deg ____ Min ____ Sec ____

Tax Parcel No.

Cased or Uncased Diameter 7" Static Level

Work/Decommission Start Date 5-2-08

Work/Decommission Completed Date 5-2-08

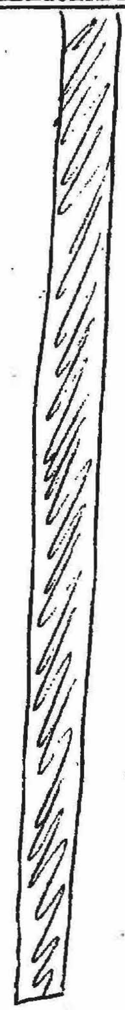
WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[x] Driller [ ] Engineer [ ] Trainee
Name (Print Last, First Name) Jeff Davies

Driller/Engineer/Trainee Signature

Driller or Trainee License No. 1543

If trainee, licensed driller's Signature and License Number:

Construction Design	Well Data	Formation Description
0 10 20 30 40 50 60 70 	Bentonite	0–40' Medium dense Light Brown sand WITH small Gravels Dry 40–70' Dense Brown sand moisT @ 40' Dry from 40'–70' with small Gravels Layers

SCALE: 1"= PAGE OF

12E2

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION

WELL SCHEDULE No 24 / 1E - 12E2

Date ______ 19 ___

Record by DM

Source ______

Location State of WASHINGTON

County Kitsap

Area ______

Map ______

___ ¼ ___ ¼ sec ___ T ___ N R ___ E/W

DIAGRAM OF SECTION

Details ______

Owner City of Bremerton (His No ___)

Address Int'l H2O Supply Ltd

Driller ______ Address ______

Topography ______

Land surface datum 260 ft above/below ______

Type Dug Drilled Driven Depth Rept 914 feet

Bored Jetted Meas ______ feet

Date ______ 1942

Casing Diam 8 to ___ in/ft Type ______

Depth ___ ft Finish ______

Chief aquifer ______ Depth ___ ft Thick ___ ft

Water level Rept/Meas 73 ft 11-30 1942 above/below ______

______ which is ___ ft above/below datum

Pump Type ______ Capacity/Size ______ gal min ______

Driven by ______ horsepower ______

Yield Flow ______ gal min Pump 25 gal min Meas Rept Est

Drawdown ______ ft after ______ hours pumping ______ gal min

Adequacy permanence ______

Use Dom Stock PS RR Ind Irr Obs ______

Quality Sample No ______ 19 ___ Temp 48 F

Taste color hardness sanitation etc ______

Other data Log Water levels Draft Pump test Analyses ______

Tu n up P 1 52

WELL SCHEDULE CONTINUED

LOGS CASINGS SCREENS AQUIFERS

(As necessary insert he dings and use space below for full reco d Complete logs should be record d on separ te fo m for that purpose but f gment ry logs may be ent r d here)

	(FEET)	(FEET)
S, Cl + G	0	13
Bl Cl w/some Bldrs	13	192
Crs S, G wb	192 -	202
Fne S	202	220
Tc S, shale		250
Shale Bl Hd S		624
Gray Shale		742
Not Recorded		914

MISCELLANEOUS

(On face of schedule add asterisks to ident fy topics mpl f ed use same top he dings here)

R

9P 1553

25597

RESOURCE PROTECTION WELL REPORT

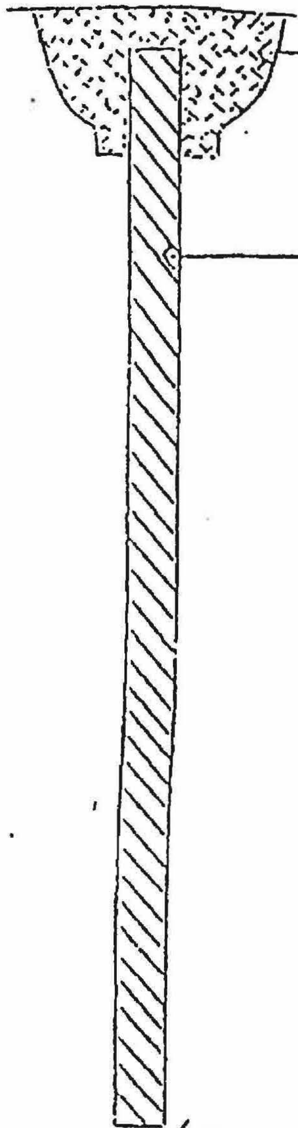
ENTERED

START CARD NO. 304058

PROJECT NAME: Harrison Medical Cntr.
WELL IDENTIFICATION NO. n/a
DRILLING METHOD: HSA
DRILLER: Brian Gose
FIRM: Cascade Drilling, Inc.
SIGNATURE: [signature]
CONSULTING FIRM: Shannon & Wilson
REPRESENTATIVE: Martin Page

COUNTY: Kitsap 24-1E-12L
LOCATION: NE1/4 SW1/4 Sec 12 Twn 24N R 1E
STREET ADDRESS OF WELL: 2520 Cherry Ave. - Bremerton
WATER LEVEL ELEVATION: N/A
GROUND SURFACE ELEVATION: N/A
INSTALLED: 4/5/99
DEVELOPED: N/a

9159

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	CONCRETE SURFACE SEAL	0 - 45 ft. brown sand + gravels
	BACKFILL 45' bent. Chips	45 - 50 ft. grey silty sand
		- ft.
	DEPTH OF BORING 50 "	

RECEIVED
APR 2 3 1999
DEPT OF ECOLOGY

SCALE: 1" = ____ PAGE ____ OF ____

106376

24-1E-12M

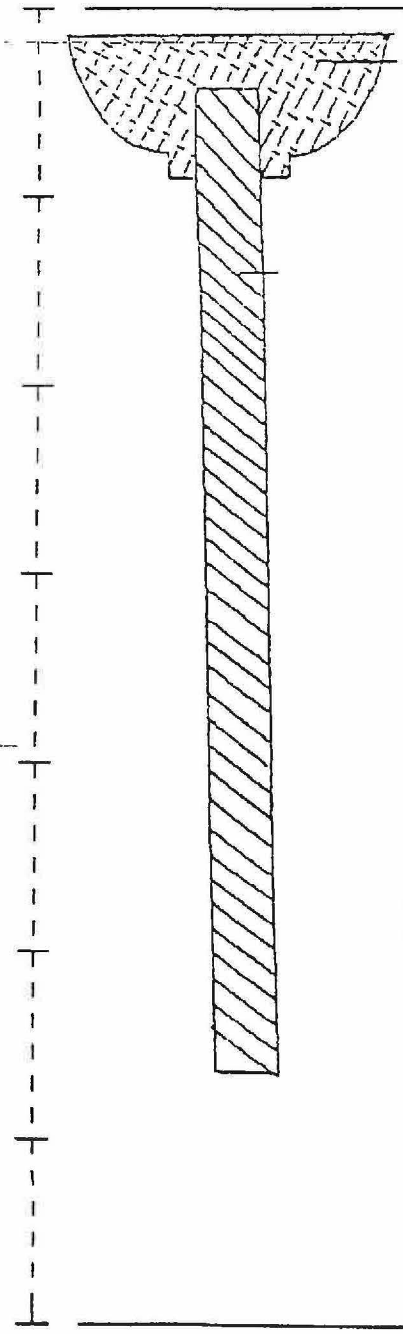
RESOURCE PROTECTION WELL REPORT

START CARD NO. S7808

PROJECT NAME: Harrison Memorial Hosp.
WELL IDENTIFICATION NO. —
DRILLING METHOD Hollow Stem Auger
DRILLER: Arturo Madrigal
FIRM: Geo-Tech Explorations, Inc
SIGNATURE: Arturo Madrigal
CONSULTING FIRM: Martin Page
REPRESENTATIVE: Shannon & Wilson

COUNTY: Kitsap
LOCATION: NW 1/4 SW 1/4 Sec 12 Twn 24N R 1E
STREET ADDRESS OF WELL: 2520 Cherry Ave
WATER LEVEL ELEVATION: —
GROUND SURFACE ELEVATION: —
INSTALLED: 12-4-01
DEVELOPED:

RECEIVED
DEC 31 2001
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

AS-BUILT	WELL DATA	FORMATION DESCRIPTION
	Concrete Surface Seal FM 0 ft. To 1 ft. Borehole Diameter: 8 in. Seal: Material: Bent. From 0 ft. To 50 ft. Amount: 25 bags Depth of Well 50 ft.	0 ft. to 50 ft. Silty Gravels ___ ft. to ___ ft. ___ ft. to ___ ft. ___ ft. to ___ ft. Number of Boreholes/Abandonment Completed The Same: 8

SCALE: 1" = ______ PAGE ____ OF ____

ECY 050-12 (Rev. 11/89)

15 E

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. **RE07123**

Construction/Decommission

- [x] Construction 453894
- [ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well

- [x] Resource Protection
- [ ] Geotechnical Soil Boring

Property Owner **BREMERTON HOUSING AUTHORITY**

Site Address **600 OYSER BAY AVENUE**

Consulting Firm **LANDAU ASSOCIATES**

City **BREMERTON** County **KITSAP**

Unique Ecology Well ID Tag No. BCK 048

Location 1/4 **SW** 1/4 **NW** Sec **15** Twn **24N** R **1E** EWM or WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

Lat/Long (s,t,r still Required) Lat Deg ______ Lat Min/Sec ______ Long Deg ______ Long Min/Sec ______

Tax Parcel No. ______

- [ ] Driller
- [ ] Trainee Name (Print) Steve Zimmerman

Driller/Trainee Signature [signature]

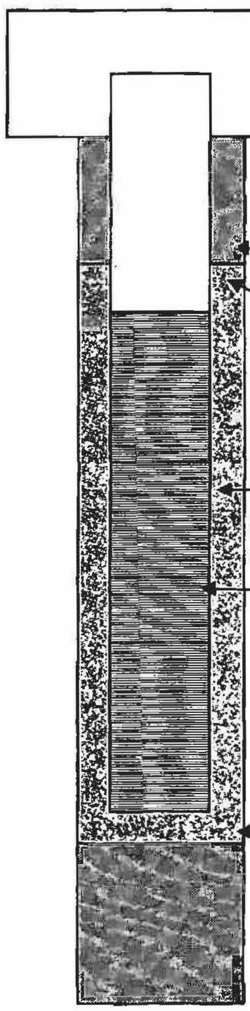
Driller/Trainee License No. 2915

Cased or Uncased Diameter ______ Static Level 63'

Work/Decommission Start Date 5/21/12

If trainee, licesned drillers' Signature and License No. ______

Work/Decommission End Date 5/22/12

Construction/Design	Well Data			Formation Description
	Concrete Surface Seal Depth	1.5	FT	0 - 15 FT Blast sand Debris 15-57 Silty Gravels 57-61 dense silt
	Blank Casing (dia x dep)	2" 0-68½		
	Material	PVC		
	Backfill		FT	
	Type			
	Seal	1.5 66		061 - 71 FT Sandy Some silt Light Gravel
	Material	Bentonite Chips		
	Gravel Pack	66-78.5	FT	71-80 Sandy Gravels
	Material	10/20 CSSI		
				0 - FT
	Screen (dia x dep)	2" 68.5-78.5		
	Slot Size	.020		
	Material	PVC		
	Well Depth	78.5	FT	RECEIVED JUN 11 2012 WA State Department of Ecology (SWRO)
	Backfill			
	Material	Slough		
	Total Hole Depth	80	FT	

Scale 1" = ______ Page ______ of ______

ECY 050-12 (Rec=v 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

DNR-00050325

24-1E-15L

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. SE09302

Construction/Decommission 410255

[X] Construction
[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well
[X] Resource Protection
[ ] Geotechnical Soil Boring

Property Owner: Shell
Site Address: 3800 Kitsap Way
City: Bremerton County: 18-Kitsap

Consulting Firm: CRA Conestoga-Rovers & Associates

Unique Ecology Well ID
Tag No. —

Location: 1/4 NE 1/4 SW Sec 15 Town 24N R1E EWM or WWM

Lat/Long (s,t,r still Required): Lat Deg x Lat Min/Sec x Long Deg x Long Min/Sec x

Tax Parcel No. 152401-3-177-2001

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

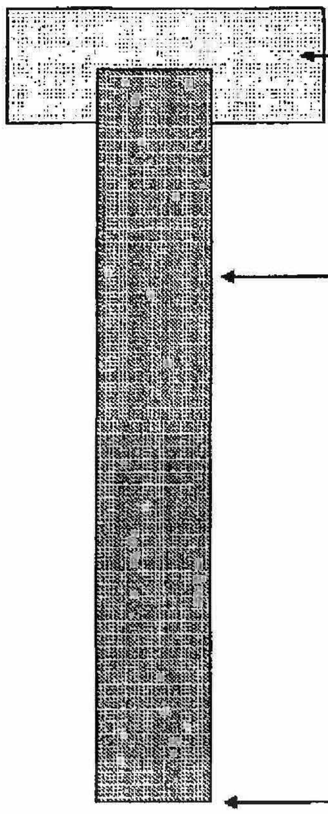
[X] Driller [ ] Trainee Name (Print) David Gose
Driller/Trainee Signature
Driller/Trainee License No. 2744

If trainee, licensed drillers' Signature and License No.

Cased or Uncased Diameter 8 1/2 Static Level —

Work/Decommission Start Date 3/16/2011

Work/Decommission Completed Date 3/17/2011

Construction/Design	Well Data W11-126B		Formation Description	
	CONCRETE SURFACE SEAL	5 FT	0 - 5' FT	Void
	BACKFILL	35 FT HYD BENT	0 5-40' FT	brown silty sands and gravels
			0 - FT	
	DEPTH OF BORING	40 FT		

Scale 1" = ______ Page ____ of ____

ECY 050-12 (Rev 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

416522

24-1E-15G

DEPARTMENT OF ECOLOGY State of Washington

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

Construction/Decommission *("x" in circle)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION*

Notice of Intent Number ______

CURRENT

Notice of Intent No. GE00244

Unique Ecology Well ID Tag No. BCR679

Water Right Permit No. ______

Property Owner Name Jim Andrews

Well Street Address 1333 Lafayette Ave N

City Bremerton County Kitsap

Location SW1/4-1/4 NE1/4 Sec 15 Twn 24N R 1E EWM ☒ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg ____ Lat Min/Sec ____

Long Deg ____ Long Min/Sec ____

Tax Parcel No. (Required) 37740090070002

PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☒ Other GEO

TYPE OF WORK: Owner's number of well (if more than one) ____

☒ New well ☐ Reconditioned *Method*: ☐ Dug ☐ Bored ☐ Driven

☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 100 ft.

Depth of completed well 100 ft.

CONSTRUCTION DETAILS

Casing Installed: ☐ Welded ____" Diam. from ____ ft. to ____ ft.

☐ Liner installed ____" Diam. from ____ ft. to ____ ft.

☐ Threaded ____" Diam. From ____ ft. to ____ ft.

Perforations: ☐ Yes ☒ No

Type of perforator used ______

SIZE of perfs ____ in. by ____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ______

Manufacturer's Name ______

Type ______ Model No. ______

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☒ No Size of gravel/sand ____

Materials placed from ____ ft. to ____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 100ft.

Material used in seal Super Grout

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? ______ Depth of strata ______

Method of sealing strata off ______

PUMP: Manufacturer's Name ______

Type: ______ H.P. ____

WATER LEVELS: Land-surface elevation above mean sea level ____ ft.

Static level ____ ft. below top of well Date ______

Artesian pressure ____ lbs. per square inch Date ______

Artesian water is controlled by ______ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom? ______

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ______

Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.

Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.

Artesian flow ____ g.p.m. Date ______

Temperature of water ____ Was a chemical analysis made? ☐ Yes ☒ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Brown fine to medium sand	0	
loose		4
Brown silty clay	4	11
Samll to medium multicolored	11	
gravel, fine brown sand loose		29
Blue silt, soft	29	48
Brown silty clay with lenses	48	
of gravel		65
Brown silty clay	65	74
Brown silty sand and gravel	74	81
Brown silty clay, stiff, dry	81	98
Small to medium gravel	98	
cobbles, with fine brown		
sand and silt		100
Installed 3/8 X 1/4 copper		
loop and grouted from bottom		
to land surface with		
Super Grout		

Si Cl

Sa+Gr loose

Qvlc

Br Si Cl w/Gr Qpn

Sa+Gr w/ Co +Si

RECEIVED JUN -8 2011 DEPARTMENT OF ECOLOGY SW REGIONAL OFFICE

Start Date 06/01/2011 Completed Date 06/01/2011

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Josh Koepp

Driller/Engineer/Trainee Signature

Driller or trainee License No. 2874

IF TRAINEE: Driller's License No:

Driller's Signature:

Drilling Company Arcadia Drilling Inc.

Address Po Box 1790

City, State, Zip Shelton, Wa. 98584

Contractor's Registration No. ARCADDI098K1 Date 06/03/2011

ECY 050-1-20 (Rev 02/10) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

Mislocat 24/01/15M

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....

Permit No. ....

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

(1) OWNER: Name John Dillon Address 6180 SW Old Clifton RD.

(2) LOCATION OF WELL: County Kitsap — NW ¼ SW ¼ Sec. 15 T. 24 N., R. 1E W.M. (maybe 1W)

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☒ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 1
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 6 ft. Depth of completed well 201 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 201 ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☐ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☒
Type of perforator used ......
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type S.T. Model No. ......
Diam. 5" Slot size 10 from 191 ft. to 201 ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ......
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bent.
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ...... Depth of strata ......
Method of sealing strata off ......

(7) PUMP: Manufacturer's Name ......
Type: ...... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 350 ft.
Static level 150 ft. below top of well Date 9-20-81
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ......
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ......
Bailer test 9 gal./min. with 40 ft. drawdown after 20 hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top Soil	0	4
Hardpan Med.	4	41
Clay and Sand	41	64
Pea gravel/some clay	64	66
Sandy Clay	66	76
Blue Clay	76	99
Hard Pan	99	131
Wet Sand	131	163
Hardpan	163	181
Dirty Sand Little Water	181	201

RECEIVED
JAN 27 1987
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

JAN 2 '87

Work started 9-20, 19 81. Completed 9-20, 19 81

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Minter Creek Drilling (Person, firm, or corporation) (Type or print)

Address 14418 Olalla RD PO

[Signed] Earl Paulson (Well Driller)

License No. 1092 Date 8-11, 19 86

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

DNR-00050328

24/01-16J

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name Arnold Rousse Address 3805 N.W. Seabeck Hwy, Bremerton

(2) LOCATION OF WELL: County Kitsap NE ¼ SE ¼ Sec. 16 T. 24 N., R. 1E W.M.

Bearing and distance from section or subdivision corner Kitsap

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)

New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 295 ft. Depth of completed well ~~6-30-79~~ 295 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 295 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 276 ft. below top of well Date 6-30-79
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test 8 gal./min. with 19 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Topsoil	0	2
Grey conglomerate	2	78
Sand & gravel	78	145
Brown conglomerate	145	248
Sand & gravel	248	259
Muddy sand	259	280
Silty sand & water	280	290
Sand & water	290	293
Sand & gravel and water	293	295

Work started June 13 1979 Completed June 30, 1979

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Tyee Well Drilling Co. Inc. (Person, firm, or corporation) (Type or print)

Address P.O. Box 30, Allyn, Wa. 98524

[Signed] Stanly E Davis (Well Driller)

License No. 0967 Date June 30, 1979

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

DNR-00050329

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT 24-1E-16QR
Notice of Intent No. SE04761

Construction/Decommission 349095

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well

[ ] Resource Protection

[X] Geotechnical Soil Boring

Property Owner: OLD LANDFILL

Site Address: 76 RUSSEl Rd

City: BREMERTON County: KITSAP

Consulting Firm: AESI

Unique Ecology Well ID Tag No. ______

Location 1/4 SE 1/4 SE Sec 16 Twn 24N R 1E EWM or WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief

[X] Driller [ ] Trainee Name (Print) Andrew Flagan

Driller/Trainee Signature ______

Driller/Trainee License No. 2761

Lat/Long (s,t,r still Required) Lat Deg ______ Lat Min/Sec ______
Long Deg ______ Long Min/Sec ______

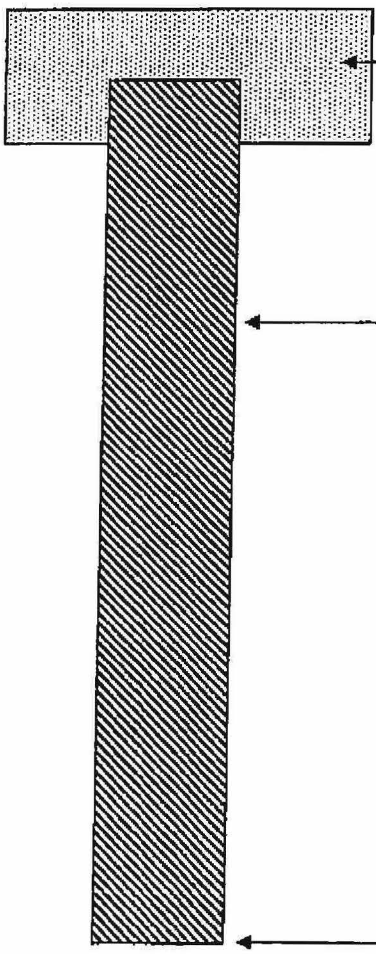
Tax Parcel No. ______

Cased or Uncased Diameter 8" Static Level N/A

Work/Decommission Start Date 6-11-09

Work/Decommision Completed Date 6-11-09

If trainee, licesned drillers' Signature and License No. ______

Construction/Design	Well Data W09-291	Formation Description
	CONCRETE SURFACE SEAL 8' FT	0 - 70' FT brown silty sand & gravel
	BACKFILL 77' bent chips	70' - 85' FT brown silty sand - outwash - gravels
		- FT
	DEPTH OF BORING 85' FT	

Scale 1" = ______ Page ______ of ______

ECY 050-12 (Rev 2/01)

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT 24-1E-16oR

Notice of Intent No. SE04761

Construction/Decommission 349094

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: Old Landfill

Site Address: 76 Russel Rd.

Consulting Firm: Associated Earth Sciences-Kirkland

City: Bremerton County: 18-Kitsap

Unique Ecology Well ID Tag No. ______

Location: 1/4 SE 1/4 SE Sec 16 Town 24N R1E EWM or WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s,t,r still Required): Lat Deg x Lat Min/Sec x Long Deg x Long Min/Sec x

[X] Driller [ ] Trainee Name (Print) Andy Flagan

Driller/Trainee Signature: [signature]

Driller/Trainee License No. 2761

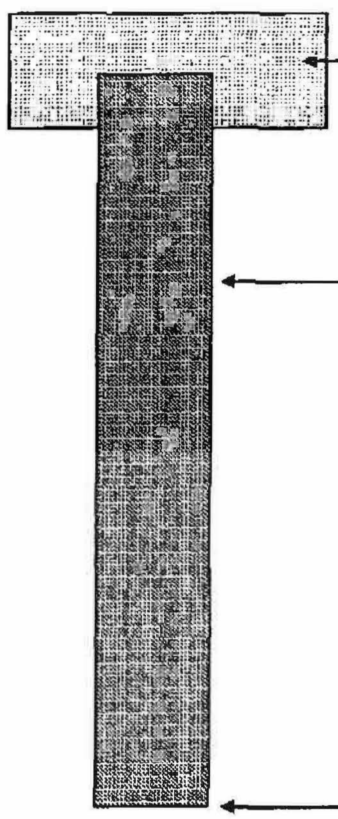
Tax Parcel No. ______

Cased or **Uncased** Diameter 8" Static Level ______

Work/Decommision Start Date 6-9-09

If trainee, licensed drillers' Signature and License No. ______

Work/Decommision Completed Date 6-8-09

Construction/Design	Well Data W09-291	Formation Description
	CONCRETE SURFACE SEAL 4' FT	0 - 20' FT brown sandy fill
	BACKFILL 47.5' FT bent chips	20-30' FT grey sandy silt
		30'-37' FT peat
		37'-50.5' grey silty sands
	DEPTH OF BORING 51.5' FT	

Scale 1" = ______ Page ____ of ____ ECY 050-12 (Rev 2/01)

RECEIVED
JUL 14 2009
Dept of Ecology
WR-NWRO

MONITORING WELL REPORT

BNAQ 310476

16 R

Well ID# Geotech Soil Boring
Start Card # SE02712

(1) OWNER/PROJECT WELL NO.
Name City of Bremerton
Address 345 6th St
City Bremerton State WA Zip 98337

(2) TYPE OF WORK

☐ New construction ☐ Alteration (Repair/Recondition)
☐ Conversion ☐ Deepening ☒ Abandonment

(3) DRILLING METHOD
☐ Rotary Air ☐ Rotary Mud ☐ Cable
☒ Hollow Stem Auger ☐ Other

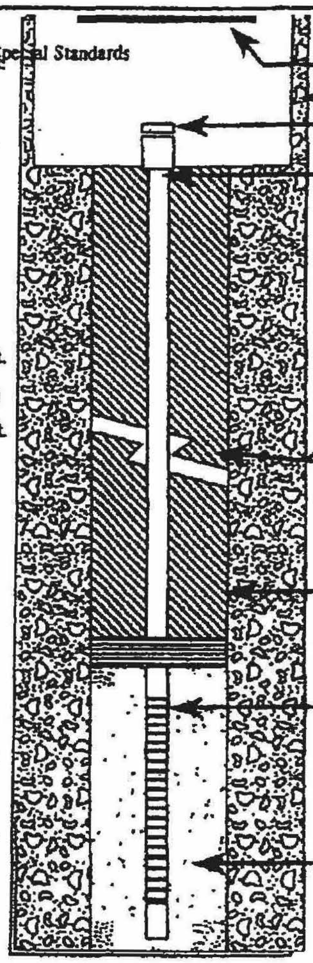
(4) BORE HOLE CONSTRUCTION:

Special Standards Yes ☐ No ☒ Depth of Completed Well 51.5 ft.

Vault
Special Standards
___ ft.
TO
___ ft.

Seal
___ ft.
TO
___ ft.

Filter pack
___ ft.
TO
___ ft.



Water-tight cover
Surface flush vault
Locking cap
Casing diameter ___
Material ___
Welded Threaded Glued
☐ ☐ ☐

Well Seal
Material Bentonite
Amount Chips
Grout weight ___

Borehole diameter:
___ in. from ___ ft. to ___ ft.
___ in. from ___ ft. to ___ ft.

Bentonite plug at least 3 ft. thick

Screen:
Material ___
From ___ ft. to ___
Slot size ___ in.

Filter pack
Material ___
Size ___

(6) LOCATION OF WELL By *legal description:*
County Kitsap Latitude ___ Longitude ___
Township 24N (N or S) Range 1E (E or W) Section 16
SE 1/4 of SE 1/4 of above section.
Street address of well location Oyster Bay Rd & Kitsap Way Bremerton WA
Tax lot number of well location N/A

(7) STATIC WATER LEVEL:
___ Ft. below land surface. Date ___
Artesian Pressure ___ lb/sq. in. Date ___

(8) WATER BEARING ZONES:

Depth at which water was first found ___

From	To	Est. Flow Rate	SWL

(9) WELL LOG:

Ground Elevation ___

Material	From	To	SWL
fill	0	51.5	

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SEP 02 2008
Washington State
Department of Ecology

Date started 7/21/08 Completed 7/21/08

(5) WELL TESTS:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian
Permeability ___ Yield ___ GPM
Conductivity ___ PH ___
Temperature of water ___ OF/C Depth artesian flow found ___ ft.
Was water analysis done? ☐ Yes ☐ No
By whom? ___
Depth of strata to be analyzed. From ___ ft. to ___ ft.
Remarks: ___

Name Of Supervising Geologist/Engineer Landau

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name Clay Griffith License No. 1850
Trainee Name Ian Wolfe License No. 2875T
Drilling Company Holocene Drilling Inc
(Signed) Clay E Griff License No. 1850
Address 10621 Todd Rd E Edgewood WA 98372
Registration No. HOLOCDI044KH Date 8/26/08

22C

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT 24-1E-22C

Notice of Intent No. S 24580

197070

Construction/Decommission

[X] Construction

[ ] Decommission ORIGINAL INSTALLATION Notice of Intent Number ______

Consulting Firm Perrone Consulting

Unique Ecology Well ID Tag No. ~

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

[X] Driller [ ] Trainee Name (Print) Frank Scott

Driller/Trainee Signature [signature]

Driller/Trainee License No. 2541

If trainee, licensed drillers' Signature and License No. ______

Type of Well

[ ] Resource Protection

[X] Geotechnical Soil Boring

Property Owner Habitat for Humanity

Site Address W. Arsenal Wy + S. Marine Av

City Bremerton County Kitsap

Location 1/4 NE 1/4 NW Sec 22 Twn 24N R 1E EWM or WWM

Lat/Long (s,t,r still Required) Lat Deg ______ Lat Min/Sec ______ Long Deg ______ Long Min/Sec ______

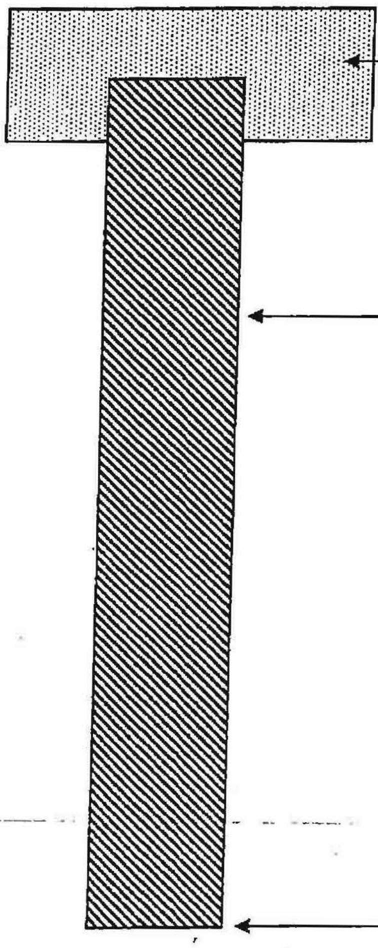
Tax Parcel No. ~

Cased or Uncased Diameter 8" Static Level N/A

Work/Decommision Start Date 5/16/06

Work/Decommision Completed Date 5/16/06

Construction/Design | Well Data W06-335 | Formation Description



CONCRETE SURFACE SEAL 2 FT

0 - 50 FT Fill

BACKFILL Bent Chips

50 - 55 FT Brown silts sand

RECEIVED
JUN 0 8 2006
DEPT. OF ECOLOGY

- FT

DEPTH OF BORING 55 FT

Scale 1" = ______ Page ______ of ______

ECY 050-12 (Rev 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

DNR-00050333

PROJECT: Crown Hill Elementary W.O. 11-08362-11 WELL NO. MW-1

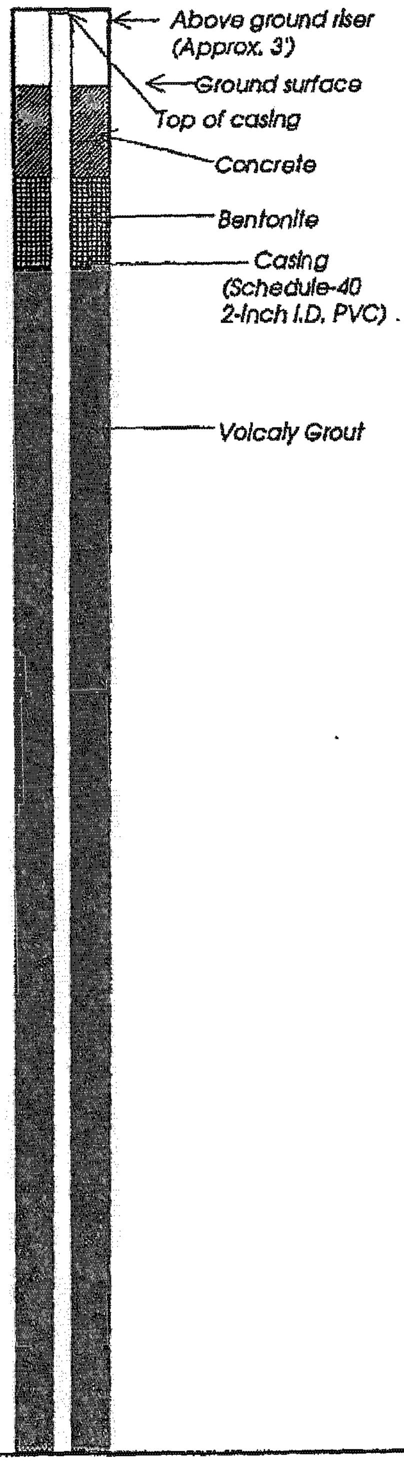
Elevation reference: Not Applicable
Ground surface elevation: 135.96 feet

Well completed: 28 December 1994
Casing elevation: 138.79 feet

AS-BUILT DESIGN

TESTING

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	Grass, sand and gravel Fill					
	Loose to medium dense, moist, brown, medium SAND with some silt					
5	Becomes dense and brownish-red	I	MW1-5	32	0	
10	Becomes very dense	I	MW1-10	56	0	
	Gravelly SAND (inferred)					
15	Decrease in gravel content (inferred)	X		50/5"		
20	Very dense, moist, brown, medium SAND with gravel and some silt (gravel is approx. 1\8-inch to 1-inch and sub-rounded)	I	MW1-20	50/4"	0	
25		I	MW1-25	50/4"	0	
30	(continued)					



LEGEND

I 2-inch O.D. split-spoon sample

Observed groundwater level ATD = at time of drilling

X Sample not recovered

EPA 8260 EPA 8270 RCRA Metals — Analytical testing

Ecology ID# ABN 150

Observed groundwater level 0/00/00 = date observed

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

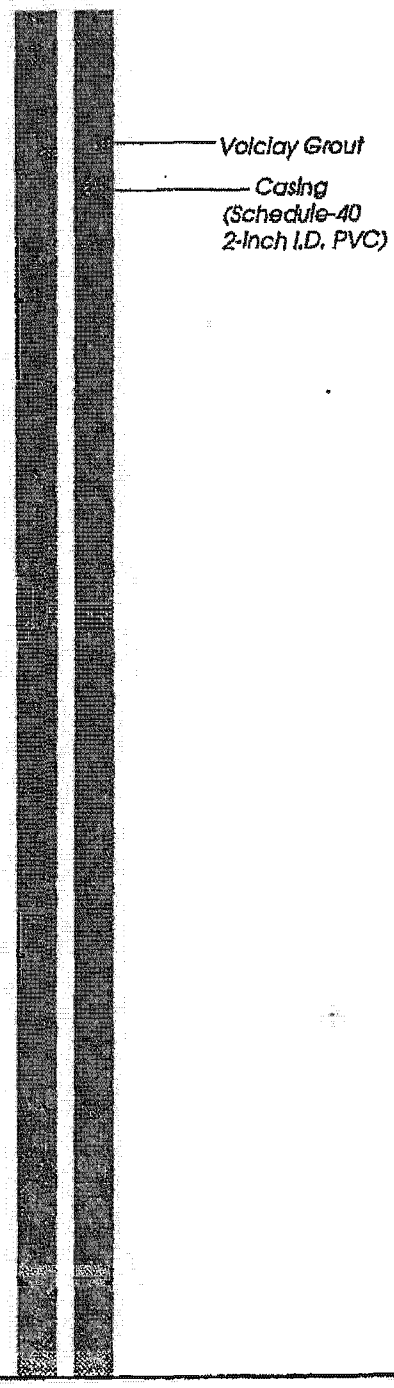
Drilling started: 27 December 1994 Drilling completed: 28 December 1994 Logged by: JK

PROJECT: Crown Hill Elementary W.O. 11-08362-11 WELL NO. MW-1

Elevation reference: Not Applicable
Ground surface elevation: 135.96 feet
Well completed: 28 December 1994
Casing elevation: 138.79 feet

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
30	Dense, damp to moist, brown, medium SAND with some gravel and trace to some silt	I	MW1-30	40	0	
35	Gravel content decreases to trace amounts	I	MW1-35	40	0	
	Becomes gravelly (inferred)					
40	Gravelly SAND (inferred:)(rock wedged in auger)	X		50/.5"		
45		X		50/.5"		
50	Very dense, damp, brown, medium SAND with gravel and trace to some silt	I	MW1-50	120/6"	0	
55		I	MW1-55	77	0	
60	(continued)					

AS-BUILT DESIGN



TESTING

LEGEND

- I 2-inch O.D. split-spoon sample
- Observed groundwater level ATD = at time of drilling
- X Sample not recovered
- EPA 8260 EPA 8270 RCRA Metals — Analytical testing
- Ecology ID# ABN 150
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Ground surface elevation: 135.96 feet
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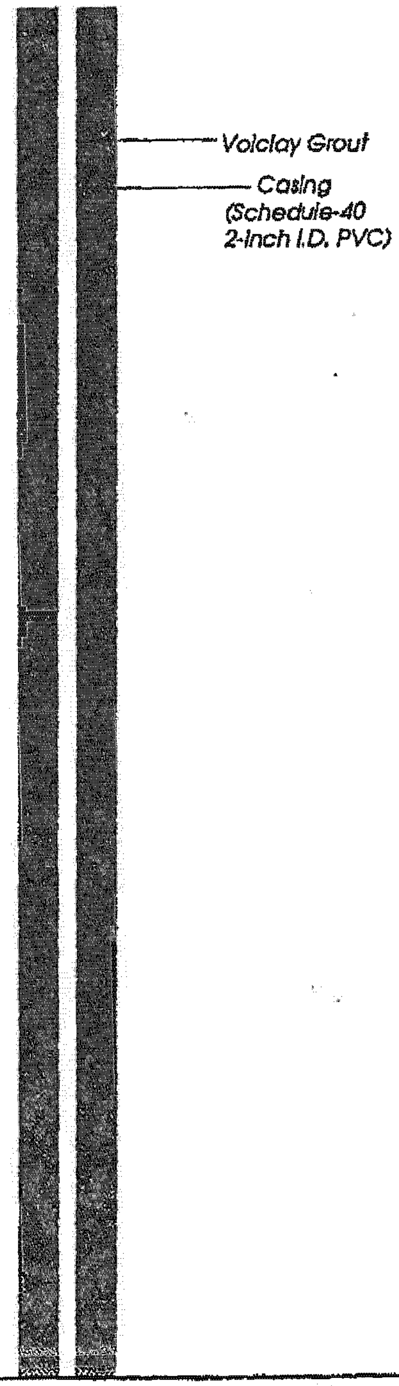
Casing elevation: 138.79 feet

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
60							
65	Very dense, damp to moist, brown, medium SAND with trace to some gravel and some silt (gravel less than 1/4-inch, sub-rounded)	I	MW1-65	71	0		
70							
75	Silt content decreases to trace	I	MW1-75	50/4"	0		
80							
85		I	MW1-85	50/5"	0		
90	(continued)						



LEGEND

2-inch O.D. split-spoon sample

Observed groundwater level ATD = at time of drilling

Sample not recovered

EPA 8260 EPA 8270 RCRA Metals — Analytical testing

Ecology ID# ABN 150

Observed groundwater level 0/00/00 = date observed

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Elevation reference: Not Applicable
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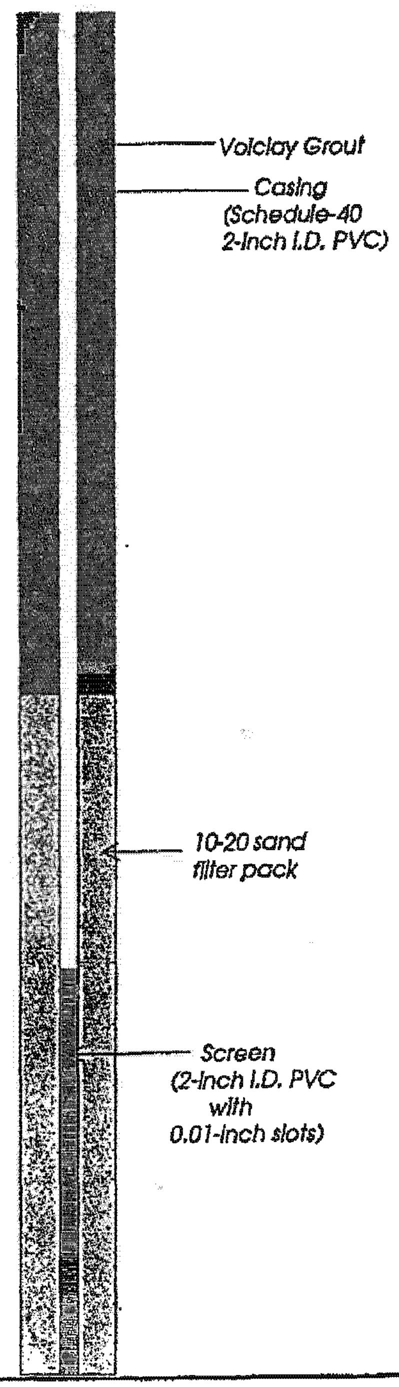
Casing elevation: 138.79 feet

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
90						
	Gravel content increases (inferred)					
95	Very dense, damp to moist, brown, medium SAND with gravel and trace to some silt (gravel size 1/2-inch to 3/4-inch)	I	MW1-95	50/5"	0	
100						
105	Very dense, damp to moist, brown, medium SAND with trace gravel and trace silt	I	MW1-105	73	0	
	Gravel content increases (inferred)					
110	Gravel content decreases (inferred)					
115		I	MW1-115	50/5"	0	
120	(continued)					

AS-BUILT DESIGN



TESTING

LEGEND

- 2-inch O.D. split-spoon sample
- Observed groundwater level ATD = at time of drilling
- Sample not recovered
- EPA 8260 / EPA 8270 / RCRA Metals — Analytical testing
- Ecology ID# ABN 150
- Observed groundwater level 0/00/00 = date observed

AGRA Earth & Environmental
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Drilling started: 27 December 1994 Drilling completed: 28 December 1994 Logged by: JK

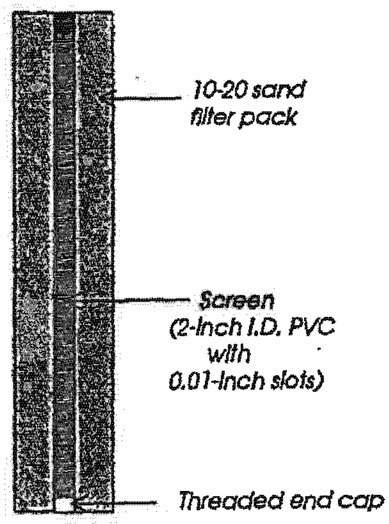
PROJECT: Crown Hill Elementary W.O. 11-08362-11 WELL NO. MW-1

Elevation reference: Not Applicable
Ground surface elevation: 135.96 feet

Well completed: 28 December 1994
Casing elevation: 138.79 feet

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
120	Very dense, damp to moist, brown, medium SAND with trace gravel and trace silt						
125		I	MW1-125	50/5"	0	1/12/95; ATD	
	Very dense, wet, brown, medium SAND with trace gravel and some silt						
130							
135	Very dense, wet, gray, fine to medium SAND with some silt and trace gravel	I	MW1-135	50/5"	0		
140		I	MW1-140	50/5.5"	0		
	Bottom of boring at 141.5 feet. No unusual odors or staining observed.						
145							
150							



LEGEND

- I 2-inch O.D. split-spoon sample
- Observed groundwater level ATD = at time of drilling
- X Sample not recovered
- EPA 8260 / EPA 8270 / RCRA Metals — Analytical testing
- Ecology ID# ABN 160
- Observed groundwater level 0/00/00 = date observed

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: 27 December 1994 Drilling completed: 28 December 1994 Logged by: JK

APPENDIX F

Soil, Groundwater, and Sediment Data

Table F-1 - Groundwater Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Groundwater Initial PRG	SW Initial PRG (for GW Screening)	MP03 5/19/08	MP04 5/15/08	MW-1 6/1/07	MW-2 6/1/07	MW-3 6/1/07	MW-4 6/1/07	MW-5 6/1/07	MW-6 6/1/07	MW-6 6/1/07 FD	MW-7 6/1/07	MW-8 6/1/07	SP02 5/15/08
Total Petroleum Hydrocarbons (TPH)														
Gasoline Range Hydrocarbons in ug/L			50 U	1,300 U	50.0 U	63.5	2,800	10,600	481	3,450	3,400	174	4,850	50 U
Diesel Range Hydrocarbons in ug/L			170 JL	510 J	236 U	236 U	236 U	18,500 Q5	236 U	540 QP	646 QP	447	1,860 Q5	250 U
Oil Range Hydrocarbons in ug/L			160 JL	500 U	472 U	472 U	472 U	2,360 U	472 U	472 U	472 U	472 U	472 U	500 U
Metals														
Total Antimony in ug/L	6	640		0.4 JQ	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	0.3 JQ
Total Arsenic in ug/L	0.045	0.14		4.1 J	1.54	1.08	14.2	26	2.83	4.8	4.43	1.43	4.69	0.6 J
Total Barium in ug/L	2,000			173										35.7
Total Beryllium in ug/L	4	0.66		0.37 JQ	1 U	1 U	1.07	1.08	1 U	1 U	1 U	1 U	1 U	1 U
Total Cadmium in ug/L	5	8.8		0.16 JQ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.05 JQ
Total Chromium (Total) in ug/L	100	42		69.6	11.8	5.15	228	177	6.07	1.34	1.06	15.6	9.28	2.4
Total Chromium (VI) in ug/L	0.031	50			6	5 U	48	33	61	23	33	11	90	
Total Cobalt in ug/L	4.7			8.3 J										1.4 J
Total Copper in ug/L	620	3.1		32 J	10.1	3.4	130	143	9	1.05	1 U	13.1	8.94	1.9 JQ
Total Lead in ug/L	15	8.1		8 J	1.55	1 U	18.3	21.6	5.12	1 U	1 U	2.23	4.47	0.44 JQ
Total Manganese in ug/L	320			3,020										98.1
Total Mercury in ug/L	0.63	0.94			0.2 U	0.2 U	0.246	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	
Total Nickel in ug/L	300	8.2		38.2 J	18.7	7.24	232	180	89.7	1.65	1.32	20.2	14.4	5.2 J
Total Selenium in ug/L	50	71		5 UJ	1 U	1 U	1 U	1 U	3.64	1 U	1 U	1 U	1 U	5 UJ
Total Silver in ug/L	71	1.9		0.07 JQ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ
Total Thallium in ug/L	0.16	0.47		0.26 JQ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total Vanadium in ug/L	63			78.2										3.7 JQ
Total Zinc in ug/L	4,700	81		37.2 J	13.4	10 U	185	155	32.1	10 U	10 U	18	12.7	4.5 J
Organometallics														
Tributyltin in ug/L	2.8	0.0074			0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	
Polycyclic Aromatic Hydrocarbons (PAHs)														
Acenaphthene in ug/L	400	990		4.9 J	0.102 U	0.0971 U	1.10	485	14.5	20.1	16.3	0.0943 U	12.3	0.05 U
Acenaphthylene in ug/L		4,840		5.4 J	0.102 U	0.0971 U	9.71 U	25.1	3.10	34.9	27.8	0.222	9.41	0.05 U
Anthracene in ug/L	1,300	40,000		0.4	0.102 U	0.0971 U	9.71 U	120	0.726	4.23	1.32	0.0943 U	0.891	0.05 U
Benzo(g,h,i)perylene in ug/L		7.64		0.05 U	0.102 U	0.0971 U	0.0979	25.6	0.639	0.221	0.104	0.0943 U	0.500	0.05 U
Dibenzofuran in ug/L	5.8	4		0.29 J	10.2 U	9.71 U	9.71 U	31.8	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Fluoranthene in ug/L	630	140		0.26	0.102 U	0.0971 U	1.95	122	3.29	11.2	9.68	0.0943 U	1.72	0.05 U
Fluorene in ug/L	220	5,300		0.25	0.102 U	0.0971 U	3.31	184	1.36	15.3	5.34	0.102	0.873	0.05 U
Phenanthrene in ug/L		1.5		0.05 U	0.102 U	0.0971 U	5.78	377	1.46	5.73	0.0943 U	0.0943 U	1.04	0.05 U
Pyrene in ug/L	87	4,000		0.36	0.102 U	0.0971 U	2.36	34.5	3.90	13.6	11.1	0.174	2.92	0.05 U
1-Methylnaphthalene in ug/L	0.97	2.1			0.102 U	0.0971 U	16.8	970	9.43 U	59.4	9.47	0.0943 U	0.813	
2-Methylnaphthalene in ug/L	27	4.2		0.35	0.102 U	0.0971 U	0.415	1,430	1.20	0.0943 U	0.0943 U	0.0943 U	0.367	0.13
Naphthalene in ug/L	0.14	13		10 J	0.102 U	0.0971 U	345	5,270	25.5	54.9	64.6	3.19	1,070	0.47
Benz(a)anthracene in ug/L	0.029	0.018		0.05 U	0.0102 U	0.00971 U	0.389	39.3	0.884	0.727	0.430	0.0168	0.694	0.05 U
Benzo(a)pyrene in ug/L	0.0029	0.018		0.05 U	0.0102 U	0.00971 U	0.217	37.6	0.905	0.345	0.158	0.0247	0.878	0.05 U
Benzo(b)fluoranthene in ug/L	0.029	0.018		0.05 U	0.0102 U	0.00971 U	0.0968	9.43 U	0.637	0.272	0.115	0.00943 U	0.657	0.05 U
Benzo(k)fluoranthene in ug/L	0.29	0.018		0.05 U	0.0102 U	0.00971 U	0.227	9.43 U	0.615	0.281	0.189	0.0602	0.494	0.05 U
Chrysene in ug/L	2.9	0.018		0.05 U	0.0102 U	0.00971 U	0.432	40.8	1.16	0.772	0.392	0.0372	0.836	0.05 U
Dibenzo(a,h)anthracene in ug/L	0.0029	0.018		0.05 U	0.0102 U	0.00971 U	0.0437	9.43 U	0.189	0.0678	0.0723	0.00943 U	0.170	0.05 U
Indeno(1,2,3-cd)pyrene in ug/L	0.029	0.018		0.05 U	0.0102 U	0.00971 U	0.0874	9.43 U	0.467	0.167	0.0985	0.00943 U	0.433	0.05 U
Total cPAHs TEQ (ND = 0) in ug/L	0.0029			ND	ND	ND	0.306	41.9	1.2	0.504	0.252	0.0328	1.13	ND
Total cPAHs TEQ (ND = 1/2 RDL) in ug/L	0.0029			ND	ND	ND	0.306	43.8	1.2	0.504	0.252	0.0342	1.13	ND
Other (Non-PAH) Semivolatiles														
1,1'-Biphenyl in ug/L	0.83	14		0.5 U										0.5 U
1,2,4,5-Tetrachlorobenzene in ug/L	1.2	1.1		0.5 U										0.5 U
1,2,4-Trimethylbenzene in ug/L	15	19		0.5 U										
2,3,4,6-Tetrachlorophenol in ug/L	170	1.2		0.5 U										0.5 U
2,4,5-Trichlorophenol in ug/L	890	12		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
2,4,6-Trichlorophenol in ug/L	3.5	2.4		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
2,4-Dichlorophenol in ug/L	35	290		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
2,4-Dimethylphenol in ug/L	270	850		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U

Table F-1 - Groundwater Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Groundwater Initial PRG	SW Initial PRG (for GW Screening)	MP03 5/19/08	MP04 5/15/08	MW-1 6/1/07	MW-2 6/1/07	MW-3 6/1/07	MW-4 6/1/07	MW-5 6/1/07	MW-6 6/1/07	MW-6 6/1/07 FD	MW-7 6/1/07	MW-8 6/1/07	SP02 5/15/08
2,4-Dinitrophenol in ug/L	30	5,300		2.5 U	20.4 U	19.4 U	19.4 U	18.9 U	18.9 U	18.9 U	18.9 U	18.9 U	19.8 U	2.5 U
2-Chloronaphthalene in ug/L	550	1,600		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
2-Chlorophenol in ug/L	71	150		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
2-Methylphenol in ug/L	720	67			10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	
2-Nitroaniline in ug/L	150			1 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	1 U
2-Nitrophenol in ug/L		2,940		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
3 & 4 Methylphenol in ug/L	1,400				10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	
3,3'-Dichlorobenzidine in ug/L	0.11	0.028		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
3-Nitroaniline in ug/L				1 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	1 U
4,6-Dinitro-2-methylphenol in ug/L	1.2	280		1 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	1 U
4-Bromophenyl phenyl ether in ug/L		1.5		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
4-Chloro-3-methylphenol in ug/L	1,100	34.8		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
4-Chloroaniline in ug/L	0.32	232		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
4-Chlorophenyl phenyl ether in ug/L				0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 UJ
4-Methylphenol in ug/L	1,400	25		0.5 U										0.5 U
4-Nitroaniline in ug/L	3.3			1 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	1 U
4-Nitrophenol in ug/L		60		1 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	1 U
Acetophenone in ug/L	1,500			0.5 U										0.5 U
Aniline in ug/L	12	2.2			10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	
Atrazine in ug/L	0.26	1.8		0.5 U										0.5 U
Benzaldehyde in ug/L	1,500			0.5 U										0.5 U
Benzidine in ug/L	0.000092	3.9		0.5 U										0.5 U
Benzoic acid in ug/L	58,000	42			20.4 U	19.4 U	19.4 U	18.9 U	18.9 U	18.9 U	18.9 U	18.9 U	19.8 U	
Benzyl alcohol in ug/L	1,500	8.6			10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	
Benzyl butyl phthalate in ug/L	14	1,900		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.33 J
Bis(2-chloro-1-methylethyl) ether in ug/L	0.31	65,000		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Bis(2-chloroethoxy)methane in ug/L	46			0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Bis(2-chloroethyl) ether in ug/L	0.012	0.53		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Bis(2-ethylhexyl) phthalate in ug/L	4.8	2.2		0.5 J	51.0 U	48.5 U	48.5 U	47.2 U	47.2 U	47.2 U	47.2 U	47.2 U	49.5 U	0.33 J
Caprolactam in ug/L	7,700			0.71 J										0.5 U
Carbazole in ug/L				1.3 J	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Diethyl phthalate in ug/L	11,000	44,000		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Dimethyl phthalate in ug/L		1,100,000		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Di-n-butyl phthalate in ug/L	670	4,500		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Di-n-octyl phthalate in ug/L	160	22		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Hexachlorobenzene in ug/L	0.042	0.00029		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Hexachlorocyclopentadiene in ug/L	22	1,100		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Hexachloroethane in ug/L	0.79	3.3		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Isophorone in ug/L	67	960		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Nitrobenzene in ug/L	0.12	690			10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	
N-Nitrosodimethylamine in ug/L	0.00042	330,000		0.5 U										0.5 U
N-Nitroso-di-n-propylamine in ug/L	0.0093	0.51		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
N-Nitrosodiphenylamine in ug/L	10	6		0.5 U	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	0.5 U
Pentachlorophenol in ug/L	0.035	3		0.1	10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	11.4	0.1 U
Phenol in ug/L	4,500	860,000		0.5 U	10.2 U	9.71 U	75.5	9.43 U	9.43 U	77.5	62.6	9.43 U	81.6	0.05 U
2,4-Dinitrotoluene in ug/L	0.2	3.4			10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	
2,6-Dinitrotoluene in ug/L	0.042	81			10.2 U	9.71 U	9.71 U	9.43 U	9.43 U	9.43 U	9.43 U	9.43 U	9.90 U	
Volatile Organic Compounds (VOC)														
1,1,1,2-Tetrachloroethane in ug/L	0.5			0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
1,1,1-Trichloroethane in ug/L	200	76		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
1,1,2 - Trichlorotrifluoroethane in ug/L	53,000			0.25 U										0.25 U
1,1,2,2-Tetrachloroethane in ug/L	0.066	4		0.25 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.25 U
1,1,2-Trichloroethane in ug/L	0.24	16		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
1,1-Dichloroethane in ug/L	2.4	47		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
1,1-Dichloroethene in ug/L	7	7,100			0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
1,1-Dichloropropene in ug/L					0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	
1,2,3-Trichlorobenzene in ug/L	5.2	8		0.5 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	0.5 U
1,2,3-Trichloropropane in ug/L	0.00065			0.25 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.25 U

Table F-1 - Groundwater Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Groundwater Initial PRG	SW Initial PRG (for GW Screening)	MP03 5/19/08	MP04 5/15/08	MW-1 6/1/07	MW-2 6/1/07	MW-3 6/1/07	MW-4 6/1/07	MW-5 6/1/07	MW-6 6/1/07	MW-6 6/1/07 FD	MW-7 6/1/07	MW-8 6/1/07	SP02 5/15/08
1,2,4-Trichlorobenzene in ug/L	0.99	70		0.5 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	0.5 U
1,2,4-Trimethylbenzene in ug/L	15	19			0.200 U	0.200 U	9.36	179	3.52	10.3	10.6	0.200 U	40.4	0.5 U
1,2-Dibromo-3-chloropropane in ug/L	0.00032			0.25 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.25 U
1,2-Dibromoethane (EDB) in ug/L	0.0065			0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
1,2-Dichlorobenzene in ug/L	280	1,300		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
1,2-Dichloroethane (EDC) in ug/L	0.15	37		0.25 U	0.200 U	4.72	3.06	0.200 U	0.200 U	0.930	0.850	0.200 U	0.200 U	0.25 U
1,2-Dichloropropane in ug/L	0.38	15		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
1,3,5-Trimethylbenzene in ug/L	87	71		0.5 U	0.500 U	0.500 U	1.87	30.0	0.530	1.26	1.22	0.500 U	5.60	0.5 U
1,3-Dichlorobenzene in ug/L		960		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
1,3-Dichloropropane in ug/L	290				0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	
1,4-Dichlorobenzene in ug/L	0.42	190		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
2,2-Dichloropropane in ug/L					0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	
2-Butanone in ug/L	4,900	2,200		5 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5 U
2-Chlorotoluene in ug/L	180				0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	
2-Hexanone in ug/L	34	99		5 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5 U
4-Chlorotoluene in ug/L	190				0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	
4-Methyl-2-pentanone in ug/L	1,000	170		5 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	5 U
Acetone in ug/L	12,000	1,700		5 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	5 U
Benzene in ug/L	0.39	51		70	0.200 U	18.4	826	25.2	85.1	950	826	2.23	650	0.35 U
Bromobenzene in ug/L	54				0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	
Bromochloromethane in ug/L	83			0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
Bromodichloromethane in ug/L	0.12	17		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
Bromoform in ug/L	7.9	140		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
Bromomethane in ug/L	7	1,500		0.25 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	0.25 U
Carbon disulfide in ug/L	720	0.92		0.25 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.25 U
Carbon tetrachloride in ug/L	0.39	1.6		0.25 U	0.660	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
Chlorobenzene in ug/L	72	1,600		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
Chloroethane in ug/L	21,000			0.25 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	0.25 U
Chloroform in ug/L	0.19	470		0.25 U	2.84	1.42	0.200	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
Chloromethane in ug/L	190	2,700		0.25 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	0.25 U
cis-1,2-Dichloroethene (DCE) in ug/L	28			0.25 U	0.200 U	0.200 U	0.370	1.29	0.200 U	0.740	0.770	0.200 U	0.200 U	0.25 U
cis-1,3-Dichloropropene in ug/L		21		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
Cyclohexane in ug/L	13,000			0.38										0.25 U
Dibromochloromethane in ug/L	0.15	13		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
Dibromomethane in ug/L	7.9				0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	
Dichlorodifluoromethane in ug/L	190			0.25 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.25 U
Ethylbenzene in ug/L	1.3	2,100		26	0.200 U	0.200 U	151	322	10.1	187	160	0.530	244	0.25 U
Hexachlorobutadiene in ug/L	0.26	18		0.25 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U	0.25 U
Isopropylbenzene in ug/L	390	2.6		3	0.500 U	0.500 U	5.29	37.4	5.25	8.93	8.90	0.500 U	8.15	0.25 U
Methyl acetate in ug/L	16,000			0.25 U										0.25 U
Methyl tert-butyl ether (MTBE) in ug/L	12	11,070		0.25 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	0.25 U
Methylcyclohexane in ug/L				0.25 U										0.25 U
Methylene chloride in ug/L	5	590		0.25 UJ	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	0.25 UJ
n-Butylbenzene in ug/L	780				0.200 U	0.200 U	0.480	5.30	0.200 U	0.590	0.520	0.200 U	0.580	
n-Hexane in ug/L	250	0.58			1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.17	1.00 U	1.00 U	1.00 U	
n-Propylbenzene in ug/L	530	128			0.500 U	0.500 U	6.41	9.20	0.500 U	3.14	3.29	0.500 U	2.38	
p-Isopropyltoluene in ug/L		85			0.200 U	0.200 U	0.900	8.44	0.200 U	0.270	0.250	0.200 U	1.17	
sec-Butylbenzene in ug/L	1,600				0.200 U	0.200 U	0.370	4.43	0.200 U	0.360	0.400	0.320	0.570	
Styrene in ug/L	100	32		0.25 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.25 U
tert-Butylbenzene in ug/L	510				0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	
Tetrachloroethene (PCE) in ug/L	5	3.3		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
Toluene in ug/L	860	15,000		1.5	0.200 U	0.200 U	4.21	41.9	0.450	3.07	3.17	0.200 U	1.49	0.25 U
trans-1,2-Dichloroethene in ug/L	86	10,000		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
trans-1,3-Dichloropropene in ug/L		21		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U
Trichloroethene (TCE) in ug/L	0.44	30		0.25 U	4.79	0.610	0.330	0.630	0.200 U	0.200 U	0.200 U	0.400	0.200 U	0.49 J
Trichlorofluoromethane in ug/L	1,100			0.25 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.25 U
Vinyl chloride in ug/L	0.015	2.4		0.25 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.25 U

Table F-1 - Groundwater Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Groundwater Initial PRG	SW Initial PRG (for GW Screening)	MP03 5/19/08	MP04 5/15/08	MW-1 6/1/07	MW-2 6/1/07	MW-3 6/1/07	MW-4 6/1/07	MW-5 6/1/07	MW-6 6/1/07	MW-6 6/1/07 FD	MW-7 6/1/07	MW-8 6/1/07	SP02 5/15/08
m,p-Xylenes in ug/L	190			0.74 J	0.500 U	0.500 U	22.4	383	3.38	6.54	7.55	0.500 U	88.4	0.25 U
o-Xylene in ug/L	190			5.8	0.250 U	0.250 U	17.2	211	4.91	12.6	12.7	0.250 U	111	0.25 U
Xylenes (total) in ug/L	190	19			0.750 U	0.750 U	39.6	593	8.29	19.2	20.3	0.750 U	191	
Polychlorinated Biphenyls (PCBs)														
Aroclor 1016 in ug/L	0.96				0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	
Aroclor 1221 in ug/L	0.004				0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	
Aroclor 1232 in ug/L	0.004				0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	
Aroclor 1242 in ug/L	0.034				0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	
Aroclor 1248 in ug/L	0.034				0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	
Aroclor 1254 in ug/L	0.034				0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	
Aroclor 1260 in ug/L	0.034				0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	
Aroclor 1262 in ug/L					0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	
Aroclor 1268 in ug/L					0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	

Notes

Concentrations in shaded cells indicate value exceeds groundwater PRG.
Concentrations within bold border indicate value exceeds SW PRG (for GW Screening).
Where a sample has multiple results for a given analyte (tested for in multiple methods) the highest detected value is shown. Where all results were non-detects, the result with the lowest detection limit is shown.
J = Analyte was positively identified. The reported result is an estimate.
JL = Estimated: The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample. Lowest available reporting limit for the analytical method used.
JQ = Approximate value due to quality control problems.
PRG = preliminary remediation goal
Q5 = Results in the diesel organics range are primarily due to overlap from a gasoline range product.
QP = Hydrocarbon result partly due to individual peak(s) in quantitation range.
SW PRG = surface preliminary remediation goal
U = Analyte was not detected at or above the reported result.
UJ = Analyte was not detected at or above the reported estimate

Table F-2 - Soil Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	BGW-RE-GP-01 9/3/13 (0-1.5ft)	BGW-RE-HA-01 9/4/13 (5-6.5ft)	MP01 5/14/08 (3.5-5ft)	MP01 5/14/08 (8.5-10ft)	MP01 5/14/08 (13.5-15ft)	MP01 5/14/08 (18.5-20ft)	MP01 5/14/08 (23.5-25ft)	MP01 5/14/08 (28.5-30ft)	MP01 5/14/08 (33.5-35ft)	MP02 5/19/08 (3.5-5ft)	MP02 5/19/08 (8.5-10ft)	MP02 5/19/08 (13.5-15ft)	MP02 5/19/08 (18.5-20ft)	MP02 5/19/08 (23.5-25ft)	MP02 5/19/08 (28.5-30ft)	MP03 5/19/08 (3.5-5ft)	MP03 5/19/08 (8.5-10ft)	MP03 5/19/08 (18.5-20ft)	MP04 5/13/08 (3.5-5ft)	MP04 5/13/08 (8.5-10ft)	MP04 5/13/08 (13.5-15ft)	MP04 5/13/08 (18.5-20ft)
Total Petroleum Hydrocarbons (TPH)																							
Gasoline Range Hydrocarbons (mg/kg)				500 U	170 U	7 U	7 U	6 U	6 U	6 U	6 U	7 U	6 U	6 U	5 U	6 U	8 U	5 U	6 U	5 JQ	7 U	6 U	6 U
Diesel Range Hydrocarbons (mg/kg)				500 U	250 U	160 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U		25 U	25 U	25 U
Oil Range Hydrocarbons (mg/kg)				250	500 U	50 U	50 U	50 U	50 U	50 U	18	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U		50 U	50 U	50 U
Metals																							
Aluminum (mg/kg)	77,000			11,200 J	11,200 J	7,360 J	6,760 J	9,680 J	11,300 J	18,500	14,600	11,500	8,700	8,120	7,850	7,240	19,300	7,670	12,200	13,400 J	8,050 J	16,500 J	8,950 J
Antimony (mg/kg)	0.27									7.5 UJ	0.8 JQ												
Arsenic (mg/kg)	0.61			1.1	2	0.9	0.8	1	1.6	3.2	1.2	0.8	0.5	0.5	0.8	0.7	4	0.9	1	1.5	0.8	2	1
Barium (mg/kg)	330			46.1 J	45.7 J	31.8 J	30.1 J	37.9 J	37.8 J	89.1	64.5	43.1	35.4	36.9	35.1	33.5	113	43.6	51.5	57.4 J	34.7 J	83.1 J	35.7 J
Beryllium (mg/kg)	21			0.2 JQ	0.2 JQ	0.2 JQ	0.2 JQ	0.2 JQ	0.2 JQ	0.4 J	0.4 JQ	0.3 JQ	0.3 JQ	0.2 JQ	0.2 JQ	0.2 JQ	0.5 JQ	0.3 JQ	0.4 JQ	0.3 JQ	0.2 JQ	0.4 JQ	0.2 JQ
Cadmium (mg/kg)	0.36			0.3 JQ	0.3 JQ	0.2 JQ	0.2 JQ	0.3 JQ	0.5 JQ	0.9	0.6 U	0.6 U	0.5 U	0.6 U	0.5 U	0.5 U	0.6 U	0.5 U	0.6 U	0.5 JQ	0.2 JQ	0.7	0.3 JQ
Calcium (mg/kg)				3,200	3,300	3,040	3,030	3,210	5,310	7,150	1,620	1,840	2,250	2,070	2,130	2,040	5,200	2,960	2,770	4,070	3,050	6,730	2,740
Chromium (Total)(mg/kg)	26			20.4	20.5	18.9	18	20.3	36.4	48.1 J	22.4	19.8	17.9	18.3	16.8	16	49.3	18.9	22.5	26.6	21.6	42.6	19.2
Chromium (VI) (mg/kg)	0.29																						
Cobalt (mg/kg)	13			5.8	6.6	5.7	5.5	6.5	10.1	15.8	6.6	5.7	5.4	5.5 JQ	5.5	5 JQ	14.8	5.7	7.2	9.2	5.5	13.3	5.5 JQ
Copper (mg/kg)	28			11.1	14.4	9.8	10.3	10.7	25.3	41.5	13	10.4	9.1	9.1	8.3	8	36.3	10.3	13.8	16.9	11.2	33.4	11.8
Iron (mg/kg)	55,000			10,900 J	13,400 J	10,900 J	10,400 J	12,800 J	18,500 J	32,600	13,500	11,200	10,700	9,940	10,100	9,570	28,500	11,300	15,000	17,800 J	11,200 J	27,100 J	11,700 J
Lead (mg/kg)	11			5.6 J	1.3 J	1 JQ	0.7 JQ	0.8 JQ	1.3 J	4.1	3.7	2.5	2.1	2	2.1	1.8	6.3	4.3	3.3	2.4 J	0.6 JQ	3.6 J	0.8 JQ
Magnesium (mg/kg)				3,750 J	4,600 J	4,290 J	4,440 J	4,610 J	5,920 J	11,000	4,210	3,810	4,140	3,640	3,770	3,520	8,650	3,410	4,590	4,930 J	3,960 J	8,530 J	4,100 J
Manganese **(mg/kg)**	220			193 J	274 J	202 J	198 J	177 J	401 J	497	225	201	194	189	193	173	526	244	261	375 J	197 J	530 J	208 J
Mercury (mg/kg)	10			0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 JQ	0.1 U
Nickel (mg/kg)	38			30.1 J	30.5 J	34.3 J	34.5 J	36.9 J	30.6 J	54	35.5	31.8	32.7	32.7	32.8	31.4	65.7	29.7	35	36.8 J	32.5 J	50.8 J	31 J
Potassium (mg/kg)				462 JQ	465 JQ	411 JQ	393 JQ	398 JQ	376 JQ	1,360	355 JQ	372 JQ	366 JQ	383 JQ	387 JQ	361 JQ	844	294 JQ	542 JQ	531 JQ	371 JQ	1,110	400 JQ
Selenium (mg/kg)	0.52			3.8 U	3.7 U	3.7 U	3.7 U	4.1 U	3.8 U	4.4 U	3.9 U	3.9 U	3.7 U	3.9 U	3.7 U	3.7 U	4.4 U	3.8 U	4.1 U	4 U	3.8 U	4.2 U	3.9 U
Silver (mg/kg)	4.2			1.1 U	1.1 U	1.1 U	1 U	1.2 U	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.3 U	1.1 U	1.2 U	1.1 U	1.1 U	1.2 U	1.1 U
Sodium (mg/kg)				176 JQ	211 JQ	215 JQ	232 JQ	149 JQ	198 JQ	422 JQ	145 JQ	120 JQ	133 JQ	126 JQ	145 JQ	122 JQ	268 JQ	202 JQ	144 JQ	254 JQ	182 JQ	417 JQ	144 JQ
Thallium (mg/kg)	0.78			2.2 JQ	2.2 JQ	1.7 JQ	1.5 JQ	2.4 JQ	2.6 JQ	4.7	2.8 U	2.8 U	2.7 U	2.8 U	2.7 U	2.7 U	3.2 U	1.1 JQ	1.2 JQ	3	1.8 JQ	4.3	1.9 JQ
Vanadium (mg/kg)	7.8			26.5	31.7	23.7	22.7	30.1	45.9	72.3	31.3	23.3	24.8	20.7	22.3	20.8	61.7	25.1	34.2	40.2	25.3	61.2	24.9
Zinc (mg/kg)	46			23.6 J	24 J	21.5 J	20.6 J	23.6 J	34.2 J	63	25.3 J	21 J	19.6 J	19.9 J	19.1 J	18.9 J	56.3 J	21.8 J	27.6 J	35.1 J	22.3 J	53.7 J	23.1 J
Organometallics																							
Tributyltin (mg/kg)	18																						
Conventional Chemistry Parameters																							
Dry Weight (Percent)																							
Total Organic Carbon (Percent)		5.2	68.5 J																				
Total Solids (Percent)		91.24	73.54 J																				
Polycyclic Aromatic Hydrocarbons (PAHs)																							
Acenaphthene (mg/kg)	3,400	0.023 J	0.11 J	0.022 U	0.0011 U	0.001 U	0.001 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0076	0.0011 U	3.4 J	0.0011 U
Acenaphthylene (mg/kg)	682	0.43	2.5 J	0.27	0.0011 U	0.001 U	0.001 U	0.0012 U	0.0011 U	0.0012 U	0.032	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0018	0.0011 U	0.88 J	0.0011 U
Anthracene (mg/kg)	17,000	0.5	2.3 J	0.16	0.0011 U	0.001 U	0.001 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0056	0.0011 U	0.33	0.0011 U
Benzo(g,h,i)perylene (mg/kg)	119	2.4	0.51 J	0.52	0.0015	0.0014	0.0019	0.0011 J	0.0012	0.0012 J	0.067	0.00099 J	0.00071 J	0.0012 U	0.0011 U	0.005	0.0013 U	0.0011 U	0.0012 U	0.0028	0.0017	0.89	0.0013
Dibenzofuran (mg/kg)	78	0.082	2.6 J	0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.31 J	0.022 U
Fluoranthene (mg/kg)	2,300	2.8	39 J	0.63	0.0011 U	0.001 U	0.001 U	0.0012 U	0.00068 J	0.0012 U	0.031	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0021	0.0013 U	0.0011 U	0.0012 U	0.0091	0.0011 U	2.9 J	0.0011 U
Fluorene (mg/kg)	2,300	0.12	0.59 J	0.079	0.0011 U	0.001 U	0.001 U	0.0012 U	0.0011 U	0.0012 U	0.0011 U	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.005	0.0011 U	2 J	0.0011 U
Phenanthrene (mg/kg)	45.7	2.1	76 J	0.6 J	0.00065 J	0.001 U	0.001 U	0.0012 U	0.00082 J	0.00071 J	0.0013	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.021	0.00083 J	13 J	0.00061 J
Pyrene (mg/kg)	1,700	4.3	19 J	1.4	0.0006 J	0.001 U	0.001 U	0.0012 U	0.00081 J	0.0012 U	0.039	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0035	0.0013 U	0.0011 U	0.0012 U	0.016	3.6 J	0.65	0.0011 U
1-Methylnaphthalene (mg/kg)	16																						
2-Methylnaphthalene (mg/kg)	230			0.047	0.0011 U	0.001 U	0.001 U	0.0012 U	0.0006 J	0.0012 U	0.0011 U	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0054	0.0011 U	11 J	0.0011 U
Naphthalene (mg/kg)	3.6	0.64	40 J	0.67 J	0.00071 J	0.0038	0.0027	0.0023	0.0017	0.0015	0.0022	0.00091 J	0.00059 J	0.0012 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	270	0.00095 J	17 J	0.001 J
Benz(a)anthracene (mg/kg)	0.15	2	2.4 J	1.1 U	0.0011 U	0.001 U	0.001 U	0.0012 U	0.0011 U	0.0012 U	0.02 J	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0038	0.0013 U	0.0011 U	0.0012 U	0.0041	0.0011 U	0.35 J	0.0011 U
Benzo(a)pyrene (mg/kg)	0.015	2.1	0.75 J	0.57	0.00069 J	0.00053 J	0.00074 J	0.0012 U	0.00056 J	0.0012 U	0.068	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0077	0.0013 U	0.0011 U	0.0012 U	0.0041	0.001 J	1.7	0.00065 J
Benzo(b)fluoranthene (mg/kg)	0.15	1.9	2.5 J	0.43	0.0011 UJ	0.001 UJ	0.001 UJ	0.0012 UJ	0.0011 UJ	0.0012 U	0.023 J	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.011 J	0.0013 U	0.0011 U	0.0012 U	0.0018 J	0.0011 UJ	0.64	0.0011 UJ
Benzo(k)fluoranthene (mg/kg)	1.5	0.89	0.88 J	0.37	0.0011 UJ	0.001 UJ	0.001 UJ	0.0012 UJ	0.0011 UJ	0.0012 U	0.055	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0047	0.0013 U	0.0011 U	0.0012 U	0.0022 J	0.00056 J	0.67	0.0011 UJ
Chrysene (mg/kg)	15	2.4	9.6 J	0.43	0.022 U	0.001 U	0.001 U	0.0012 U	0.00067 J	0.00067 J	0.035	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0069	0.0013 U	0.0011 U	0.0012 U	0.0052	0.00073 J	0.28 J	0.0011 U
Dibenzo(a,h)anthracene (mg/kg)	0.015	0.35 J	0.25 J	0.13 J	0.0012	0.0011	0.0016	0.00088 J	0.00092 J	0.00093 J	0.02 J	0.0011 U	0.001 U	0.0012 U	0.0011 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0019	0.0014	0.24 J	0.0011
Indeno(1,2,3-cd)pyrene (mg/kg)	0.15	1.4	0.47 J	0.39	0.0014	0.0013	0.0018	0.001 J	0.0011	0.0011 J	0.055	0.00066 J	0.001 U	0.0012 U	0.0011 U	0.0035	0.0013 U	0.0011 U	0.0012 U	0.0026	0.0016	0.74	0.0013
Total cPAHs TEQ (ND = 0) (mg/kg)	0.015	2.9913 J	1.5554 J	0.706	0.00095	0.00077	0.00108	0.00019 J	0.00077	0.00021 J	0.0857	6.6E-05 J	ND	ND	ND	0.0101	ND	ND	ND	0.00541	0.00136	1.97	0.00089
Total cPAHs TEQ (ND = 1/2 RDL) (mg/kg)	0.015	2.9913 J	1.5554 J	0.761	0.00123	0.00093	0.00124	0.00097 J	0.00093	0.00099 J	0.0857	0.00084 J	ND	ND	ND	0.0101	ND	ND	ND	0.00541	0.00147	1.97	0.00106

Table F-2 - Soil Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	BGW-RE-GP-01 9/3/13 (0-1.5ft)	BGW-RE-HA-01 9/4/13 (5-6.5ft)	MP01 5/14/08 (3.5-5ft)	MP01 5/14/08 (8.5-10ft)	MP01 5/14/08 (13.5-15ft)	MP01 5/14/08 (18.5-20ft)	MP01 5/14/08 (23.5-25ft)	MP01 5/14/08 (28.5-30ft)	MP01 5/14/08 (33.5-35ft)	MP02 5/19/08 (3.5-5ft)	MP02 5/19/08 (8.5-10ft)	MP02 5/19/08 (13.5-15ft)	MP02 5/19/08 (18.5-20ft)	MP02 5/19/08 (23.5-25ft)	MP02 5/19/08 (28.5-30ft)	MP03 5/19/08 (3.5-5ft)	MP03 5/19/08 (8.5-10ft)	MP03 5/19/08 (18.5-20ft)	MP04 5/13/08 (3.5-5ft)	MP04 5/13/08 (8.5-10ft)	MP04 5/13/08 (13.5-15ft)	MP04 5/13/08 (18.5-20ft)
Other (Non-PAH) Semivolatiles																							
1,1'-Biphenyl (mg/kg)	51			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.3 J	0.022 U
1,2,4,5-Tetrachlorobenzene (mg/kg)	18			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
1,4-Dioxane (mg/kg)	4.6			0.14 U	0.13 U	0.14 U	0.13 U	0.13 U	0.11 U	0.13 U	0.11 U	0.12 U	0.14 U	0.13 U	0.11 U	0.11 U	0.13 UJ	0.091 UJ	0.11 UJ	0.1 U	0.15 U	0.12 U	0.13 U
2,3,4,6-Tetrachlorophenol (mg/kg)	1,800			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
2,4,5-Trichlorophenol (mg/kg)	6,100			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
2,4,6-Trichlorophenol (mg/kg)	44			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
2,4-Dichlorophenol (mg/kg)	180			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
2,4-Dimethylphenol (mg/kg)	1,200			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
2,4-Dinitrophenol (mg/kg)	120			0.11 UJ	0.11 UJ	0.11 UJ	0.11 UJ	0.12 UJ	0.11 UJ	0.12 UJ	0.12 U	0.11 U	0.11 U	0.12 U	0.11 U	0.11 U	0.13 UJ	0.11 UJ	0.12 UJ	0.11 UJ	0.11 UJ	0.12 UJ	0.11 UJ
2-Chloronaphthalene (mg/kg)	6,300			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
2-Chlorophenol (mg/kg)	390			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
2-Methylphenol (mg/kg)	3,100																						
2-Nitroaniline (mg/kg)	610			0.044 U	0.044 U	0.043 U	0.043 U	0.048 U	0.044 U	0.051 U	0.047 U	0.045 U	0.043 U	0.048 U	0.044 U	0.045 U	0.052 U	0.045 U	0.05 U	0.046 U	0.045 U	0.048 U	0.045 U
2-Nitrophenol (mg/kg)	1.6			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
3 & 4 Methylphenol (mg/kg)																							
3,3'-Dichlorobenzidine (mg/kg)	1.1			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
3-Nitroaniline (mg/kg)	3.16			0.044 U	0.044 U	0.043 U	0.043 U	0.048 U	0.044 U	0.051 U	0.047 U	0.045 U	0.043 U	0.048 U	0.044 U	0.045 U	0.052 U	0.045 U	0.05 U	0.046 U	0.045 U	0.048 U	0.045 U
4,6-Dinitro-2-methylphenol (mg/kg)	4.9			0.044 U	0.044 U	0.043 U	0.043 U	0.048 U	0.044 U	0.051 U	0.047 U	0.045 U	0.043 U	0.048 U	0.044 U	0.045 U	0.052 UJ	0.044 UJ	0.049 UJ	0.046 U	0.045 U	0.048 U	0.045 U
4-Bromophenyl phenyl ether (mg/kg)				0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
4-Chloro-3-methylphenol (mg/kg)	6,100			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
4-Chloroaniline (mg/kg)	2.4			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
4-Chlorophenyl phenyl ether (mg/kg)				0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
4-Methylphenol (mg/kg)	6,100			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
4-Nitroaniline (mg/kg)	24			0.044 U	0.044 U	0.043 U	0.043 U	0.048 U	0.044 U	0.051 U	0.047 U	0.045 U	0.043 U	0.048 U	0.044 U	0.045 U	0.052 U	0.045 U	0.05 U	0.046 U	0.045 U	0.048 U	0.045 U
4-Nitrophenol (mg/kg)	5.12			0.044 U	0.044 U	0.043 U	0.043 U	0.048 U	0.044 U	0.051 U	0.047 U	0.045 U	0.043 U	0.048 U	0.044 U	0.045 U	0.052 U	0.045 U	0.05 U	0.046 U	0.045 U	0.048 U	0.045 U
Acetophenone (mg/kg)	7,800			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Aniline (mg/kg)	85																						
Atrazine (mg/kg)	2.1			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Benzaldehyde (mg/kg)	7,800			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Benzidine (mg/kg)	0.0005			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Benzoic acid (mg/kg)	240,000																						
Benzyl alcohol (mg/kg)	6,100																						
Benzyl butyl phthalate (mg/kg)	260			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.029	0.023 U	0.023 U	0.019 J	0.017 J	0.015 J	0.022 U	0.016 J	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Bis(2-chloro-1-methylethyl) ether (mg/kg)	4.6			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Bis(2-chloroethoxy)methane (mg/kg)	180			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Bis(2-chloroethyl) ether (mg/kg)	0.21			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Bis(2-ethylhexyl) phthalate (mg/kg)	35			0.18 J	0.082	0.1	0.075	0.093	0.083	0.25	0.29	0.12	0.15	0.18	0.13	0.1	0.24	0.082	0.16	0.1	0.1	0.024 U	0.082
Caprolactam (mg/kg)	30,000			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.015 J	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Carbazole (mg/kg)				0.026	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Diethyl phthalate (mg/kg)	49,000			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Dimethyl phthalate (mg/kg)	734			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Di-n-butyl phthalate (mg/kg)	6,100			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.014 J	0.016 J	0.023 U	0.013 J	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Di-n-octyl phthalate (mg/kg)	610			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Hexachlorobenzene (mg/kg)	0.3			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Hexachlorocyclopentadiene (mg/kg)	370			0.054 UJ	0.054 UJ	0.054 UJ	0.054 UJ	0.06 UJ	0.055 UJ	0.062 UJ	0.059 U	0.057 U	0.054 U	0.06 U	0.055 U	0.056 U	0.065 U	0.056 UJ	0.061 UJ	0.057 UJ	0.057 UJ	0.06 UJ	0.056 UJ
Hexachloroethane (mg/kg)	12			0.0029 U	0.0026 U	0.0029 U	0.0025 U	0.0025 U	0.0022 U	0.0026 U	0.0023 U	0.0025 U	0.0027 U	0.0026 U	0.0023 U	0.0023 U	0.0025 U	0.0018 U	0.0022 U	0.002 U	0.003 U	0.0024 U	0.0026 U
Isophorone (mg/kg)	510			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Nitrobenzene (mg/kg)	4.8																						
N-Nitrosodimethylamine (mg/kg)	0.0023			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
N-Nitroso-di-n-propylamine (mg/kg)	0.069			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
N-Nitrosodiphenylamine (mg/kg)	99			0.022 U	0.022 UJ	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
Pentachlorophenol (mg/kg)	0.89			0.022 UJ	0.0022 U	0.0021 U	0.0021 U	0.0024 U	0.0022 U	0.0025 U	0.0023 U	0.00096 J	0.0021 U	0.0024 U	0.0022 U	0.0022 U	0.026 UJ	0.022 UJ	0.024 UJ	0.0023 U	0.0022 U	0.024 U	0.0022 U
Phenol (mg/kg)	18,000			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.024 U	0.022 U
2,4-Dinitrotoluene (mg/kg)	1.6																						
2,6-Dinitrotoluene (mg/kg)	0.0328																						

Table F-2 - Soil Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	BGW-RE-GP-01 9/3/13 (0-1.5ft)	BGW-RE-HA-01 9/4/13 (5-6.5ft)	MP01 5/14/08 (3.5-5ft)	MP01 5/14/08 (8.5-10ft)	MP01 5/14/08 (13.5-15ft)	MP01 5/14/08 (18.5-20ft)	MP01 5/14/08 (23.5-25ft)	MP01 5/14/08 (28.5-30ft)	MP01 5/14/08 (33.5-35ft)	MP02 5/19/08 (3.5-5ft)	MP02 5/19/08 (8.5-10ft)	MP02 5/19/08 (13.5-15ft)	MP02 5/19/08 (18.5-20ft)	MP02 5/19/08 (23.5-25ft)	MP02 5/19/08 (28.5-30ft)	MP03 5/19/08 (3.5-5ft)	MP03 5/19/08 (8.5-10ft)	MP03 5/19/08 (18.5-20ft)	MP04 5/13/08 (3.5-5ft)	MP04 5/13/08 (8.5-10ft)	MP04 5/13/08 (13.5-15ft)	MP04 5/13/08 (18.5-20ft)
Volatile Organic Compounds (VOC)																							
1,1,1,2-Tetrachloroethane (mg/kg)	1.9			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,1,1-Trichloroethane (mg/kg)	8,700			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,1,2 - Trichlorotrifluoroethane (mg/kg)	43,000			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,1,2,2-Tetrachloroethane (mg/kg)	0.56			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,1,2-Trichloroethane (mg/kg)	1.1			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,1-Dichloroethane (mg/kg)	3.3			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,1-Dichloroethene (mg/kg)	240			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U			0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,1-Dichloropropene (mg/kg)																							
1,2,3-Trichlorobenzene (mg/kg)	49			0.0072 U	0.0064 U	0.0071 U	0.0063 U	0.0063 U	0.0055 U	0.0065 U	0.0057 U	0.0062 U	0.0068 U	0.0064 U	0.0057 U	0.0057 U	0.0013 U	0.00091 U	0.0011 U	0.005 U	0.0075 U	0.006 U	0.0065 U
1,2,3-Trichloropropane (mg/kg)	0.005			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,2,4-Trichlorobenzene (mg/kg)	22			0.0072 U	0.0064 U	0.0071 U	0.0063 U	0.0063 U	0.0055 U	0.0065 U	0.0057 U	0.0062 U	0.0068 U	0.0064 U	0.0057 U	0.0057 U	0.0013 U	0.00091 U	0.0011 U	0.005 U	0.0075 U	0.006 U	0.0065 U
1,2,4-Trimethylbenzene (mg/kg)	62			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.042	0.022 U
1,2-Dibromo-3-chloropropane (mg/kg)	0.0054			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,2-Dibromoethane (EDB) (mg/kg)	0.034			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,2-Dichlorobenzene (mg/kg)	1,900			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,2-Dichloroethane (EDC) (mg/kg)	0.43			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,2-Dichloropropane (mg/kg)	0.94			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U		0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,3,5-Trimethylbenzene (mg/kg)	780			0.022 U	0.022 U	0.022 U	0.021 U	0.024 U	0.022 U	0.025 U	0.023 U	0.023 U	0.022 U	0.024 U	0.022 U	0.022 U	0.026 U	0.022 U	0.025 U	0.023 U	0.023 U	0.14	0.022 U
1,3-Dichlorobenzene (mg/kg)	37.7			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,3-Dichloropropane (mg/kg)	1,600																						
1,4-Dichlorobenzene (mg/kg)	2.4			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
1,4-Difluorobenzene (mg/kg)																							
2,2-Dichloropropane (mg/kg)																							
2-Butanone (mg/kg)	28,000			0.0072 U	0.0064 U	0.0071 U	0.0063 U	0.0063 U	0.0055 U	0.0065 U	0.0057 U	0.0062 U	0.0068 U	0.0064 U	0.0057 U	0.0057 U	0.0063 U	0.0046 U	0.0054 U	0.005 U	0.0075 U	0.006 U	0.0065 U
2-Chlorotoluene (mg/kg)	1,600																						
2-Hexanone (mg/kg)	12.6			0.0072 UJ	0.0064 UJ	0.0071 UJ	0.0063 UJ	0.0063 UJ	0.0055 UJ	0.0065 UJ	0.0057 U	0.0062 U	0.0068 U	0.0064 U	0.0057 U	0.0057 U	0.0063 UJ	0.0046 UJ	0.0054 Uj	0.005 UJ	0.0075 UJ	0.006 UJ	0.0065 UJ
4-Chlorotoluene (mg/kg)	1,600																						
4-Methyl-2-pentanone (mg/kg)	5,300			0.0072 U	0.0064 U	0.0071 U	0.0063 U	0.0063 U	0.0055 U	0.0065 U	0.0057 U	0.0062 U	0.0068 U	0.0064 U	0.0057 U	0.0057 U	0.0063 U	0.0046 U	0.0054 U	0.005 U	0.0075 U	0.006 U	0.0065 U
Acetone (mg/kg)	61,000			0.026	0.011	0.0071 U	0.0063 U	0.021	0.0095	0.02	0.0057 U	0.0062 U	0.0068 U	0.017	0.016	0.016	0.0063 U	0.0046 U	0.0065	0.028	0.013	0.006 U	0.0097
Benzene (mg/kg)	1.1			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 UJ	0.001 U	0.0015 U	0.0012 U	0.0013 U
Bromobenzene (mg/kg)	300																						
Bromochloromethane (mg/kg)	160			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Bromodichloromethane (mg/kg)	0.27			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Bromoform (mg/kg)	15.9			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Bromomethane (mg/kg)	7.3			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U		0.001 U	0.0015 U	0.0012 U	0.0013 U
Carbon disulfide (mg/kg)	820			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Carbon tetrachloride (mg/kg)	0.61			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Chlorobenzene (mg/kg)	290			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Chlorobenzene-d5 (mg/kg)																							
Chloroethane (mg/kg)	15,000			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Chloroform (mg/kg)	0.29			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Chloromethane (mg/kg)	120			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
cis-1,2-Dichloroethene (DCE) (mg/kg)	160			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
cis-1,3-Dichloropropene (mg/kg)	0.398			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Cyclohexane (mg/kg)	7,000			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Dibromochloromethane (mg/kg)	0.68			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Dibromomethane (mg/kg)	25																						
Dichlorodifluoromethane (mg/kg)	94			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Ethylbenzene (mg/kg)	5.4			0.0014 U	0.0013 U	0.0067	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 UJ	0.086 J	0.0015 U	0.0012 U	0.0013 U
Hexachlorobutadiene (mg/kg)	6.2			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Isopropylbenzene (mg/kg)	2,100			0.0014 U	0.0013 U	0.0017	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 UJ	0.0078	0.0015 U	0.0012 U	0.0013 U
Methyl acetate (mg/kg)	78,000			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Methyl tert-butyl ether (MTBE) (mg/kg)	43			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Methylcyclohexane (mg/kg)				0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.0038	0.0015 U	0.0012 U	0.0013 U
Methylene chloride (mg/kg)	56			0.00069 J	0.00058 J	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0028	0.0027	0.0016	0.0017	0.0013	0.0011 J	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.00059 J	0.0013 U
n-Butylbenzene (mg/kg)	3,900																						
n-Hexane (mg/kg)	570																						

Table F-2 - Soil Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	BGW-RE-GP-01 9/3/13 (0-1.5ft)	BGW-RE-HA-01 9/4/13 (5-6.5ft)	MP01 5/14/08 (3.5-5ft)	MP01 5/14/08 (8.5-10ft)	MP01 5/14/08 (13.5-15ft)	MP01 5/14/08 (18.5-20ft)	MP01 5/14/08 (23.5-25ft)	MP01 5/14/08 (28.5-30ft)	MP01 5/14/08 (33.5-35ft)	MP02 5/19/08 (3.5-5ft)	MP02 5/19/08 (8.5-10ft)	MP02 5/19/08 (13.5-15ft)	MP02 5/19/08 (18.5-20ft)	MP02 5/19/08 (23.5-25ft)	MP02 5/19/08 (28.5-30ft)	MP03 5/19/08 (3.5-5ft)	MP03 5/19/08 (8.5-10ft)	MP03 5/19/08 (18.5-20ft)	MP04 5/13/08 (3.5-5ft)	MP04 5/13/08 (8.5-10ft)	MP04 5/13/08 (13.5-15ft)	MP04 5/13/08 (18.5-20ft)
n-Propylbenzene (mg/kg)	3,400																						
Pentafluorobenzene (mg/kg)																							
p-Isopropyltoluene (mg/kg)																							
sec-Butylbenzene (mg/kg)	7,800																						
Styrene (mg/kg)	6,300			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 UJ	0.001 U	0.0015 U	0.0012 U	0.0013 U
tert-Butylbenzene (mg/kg)	7,800																						
Tetrachloroethene (PCE) (mg/kg)	22			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 UJ	0.001 U	0.0015 U	0.0012 U	0.0013 U
Toluene (mg/kg)	5,000			0.0014 J	0.00038 J	0.00078 J	0.00046 J	0.0012 J	0.00048 J	0.00078 J	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00026 J	0.00099 J	0.0048	0.0015 U	0.0012 U	0.00047 J
trans-1,2-Dichloroethene (mg/kg)	150			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
trans-1,3-Dichloropropene (mg/kg)	0.398			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Trichloroethene (TCE) (mg/kg)	0.91			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 UJ	0.001 U	0.0015 U	0.0012 U	0.0013 U
Trichlorofluoromethane (mg/kg)	790			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
Vinyl chloride (mg/kg)	0.06			0.0014 U	0.0013 U	0.0014 U	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 U	0.001 U	0.0015 U	0.0012 U	0.0013 U
m,p-Xylenes (mg/kg)	630			0.0014 U	0.0013 U	0.043	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 UJ	0.072 J	0.0015 U	0.0012 U	0.0013 U
o-Xylene (mg/kg)	690			0.0014 U	0.0013 U	0.011	0.0013 U	0.0013 U	0.0011 U	0.0013 U	0.0011 U	0.0012 U	0.0014 U	0.0013 U	0.0011 U	0.0011 U	0.0013 U	0.00091 U	0.0011 UJ	0.094 J	0.0015 U	0.0012 U	0.0013 U
Xylenes (total) (mg/kg)	630																						
Polychlorinated Biphenyls (PCBs)																							
Aroclor 1016 (mg/kg)	3.9																						
Aroclor 1221 (mg/kg)	0.14																						
Aroclor 1232 (mg/kg)	0.14																						
Aroclor 1242 (mg/kg)	0.22																						
Aroclor 1248 (mg/kg)	0.22																						
Aroclor 1254 (mg/kg)	0.22																						
Aroclor 1260 (mg/kg)	0.22																						
Aroclor 1262 (mg/kg)																							
Aroclor 1268 (mg/kg)																							

Table F-2 - Soil Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	MP04 5/13/08 (25-26.5ft)	MP04 5/12/08 (35-37.5ft)	MP04 5/13/08 (35-37.5ft)	MP04 5/13/08 (38.5-40ft)	MW-1 5/21/07 (5-6.5ft)	MW-1 5/21/07 (35-36.5ft)	MW-2 5/21/07 (10-11.5ft)	MW-2 5/21/07 (40-41.5ft)	MW-3 5/22/07 (5-6.5ft)	MW-3 5/22/07 (25-26.5ft)	MW-4 5/23/07 (15-16.5ft)	MW-4 5/23/07 (30-31.5ft)	MW-5 5/24/07 (10-11.5ft)	MW-5 5/24/07 (20-21.5ft)	MW-6 5/22/07 (5-6.5ft)	MW-6 5/22/07 (10-11.5ft)	MW-6 5/22/07 (35-36.5ft)	MW-7 5/23/07 (5-6.5ft)	MW-7 5/23/07 (25-26.5ft)	MW-8 5/22/07 (10-11.5ft)	MW-8 5/22/07 (25-26.5ft)
Total Petroleum Hydrocarbons (TPH)																						
Gasoline Range Hydrocarbons (mg/kg)		6 U	12 U	6 U	6 U	13.2 U	10.3 U	21.9	12.3 U	645	10.8 U	185	635	5.62 U	5.69 U	11.5 U	541	9.16 U	10.6	216	11.8 U	11.9 U
Diesel Range Hydrocarbons (mg/kg)		25 U	25 U	25 U	25 U	13.2 U	12.1 U	617	12.3 U	6,710 JP	10.7 U	2,960 JP	4,370	402 JP	11.6 U	11.4 U	3,770 JP	11.2 U	17.1 JP	30,200	11.6 U	336 JP
Oil Range Hydrocarbons (mg/kg)		50 U	50 U	50 U	50 U	32.9 U	30.3 U	965	30.7 U	2,250 JP	26.6 U	412	274 U	232 JP	29.0 U	28.5 U	390 JP	28.1 U	30.6 U	2,900 U	29.0 U	138 JP
Metals																						
Aluminum (mg/kg)	77,000	20,300 J	7,900		6,370																	
Antimony (mg/kg)	0.27		6.8 UJ		7.1 UJ	1.98 U	1.82 U	1.69 U	1.84 U	1.80 U	1.62 U	1.63 U	1.53 U	1.86 U	1.53 U	1.64 U	1.58 U	1.82 U	1.84 U	1.81 U	1.77 U	1.69 U
Arsenic (mg/kg)	0.61	3.6	0.6		0.7	3.49	1.35	3.18	0.797	48.4	1.27	2.58	4.80	3.81	0.833	1.64	1.26	0.841	2.72	1.01	6.72	2.25
Barium (mg/kg)	330	91.2 J	27.3		23.9																	
Beryllium (mg/kg)	21	0.4 JQ	0.2 JQ		0.1 JQ	0.661 U	0.607 U	0.563 U	0.613 U	0.600 U	0.540 U	0.544 U	0.509 U	0.620 U	0.511 U	0.547 U	0.527 U	0.605 U	0.614 U	0.604 U	0.589 U	0.562 U
Cadmium (mg/kg)	0.36	0.9	0.2 JQ		0.2 JQ	0.661 U	0.607 U	0.563 U	0.613 U	0.600 U	0.540 U	0.544 U	0.509 U	0.620 U	0.511 U	0.547 U	0.527 U	0.605 U	0.614 U	0.604 U	0.966	0.562 U
Calcium (mg/kg)		6,740	3,770		2,960																	
Chromium (Total)(mg/kg)	26	48.4	21.7 J		14.6 J	39.5	19.8	35.0	24.7	26.3	23.9	31.8	46.5	33.1	26.3	33.1	19.9	24.8	40.1	25.2	36.0	39.4
Chromium (VI) (mg/kg)	0.29					1.2 U	1.2 U	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	1.0 U	1.1 U	1.2 U	1.1 U	1.1 U	1.0 U	1.2 U	1.0 U	1.0 U	1.1 U
Cobalt (mg/kg)	13	19	5.8		4.9 JQ																	
Copper (mg/kg)	28	43.1	12.2		11.7	24.8	8.01	18.4	10.1	37.8	11.0	23.3	22.0	79.1	11.1	15.5	9.47	16.4	18.2	12.5	68.1	23.3
Iron (mg/kg)	55,000	31,700 J	12,600		10,100																	
Lead (mg/kg)	11	4.5 J	0.7 JQ		1.2 U	3.86	1.58	41.3	1.34	87.0	1.54	13.9	2.12	131	1.44	2.78	1.36	1.30	5.75	1.67	246	4.75
Magnesium (mg/kg)		9,430 J	4,580		3,650																	
Manganese **(mg/kg)**	220	597 J	217		179																	
Mercury (mg/kg)	10	0.1 JQ	0.1 U		0.1 U	0.134 U	0.111 U	0.107 U	0.131 U	0.129 U	0.0976 U	0.101 U	0.0937 U	1.62	0.0941 U	0.113 U	0.104 U	0.111 U	0.111 U	0.0956 U	0.392	0.105 U
Nickel (mg/kg)	38	66.3 J	28.4		21.2	48.3	32.5	40.6	32.0	37.5	36.2	38.1	44.6	61.1	34.6	38.6	28.8	33.3	51.8	43.3	42.1	37.2
Potassium (mg/kg)		1,240	372 JQ		344 JQ																	
Selenium (mg/kg)	0.52	4.4 U	4 U		4.1 U	0.661 U	0.607 U	0.563 U	0.613 U	0.600 U	0.540 U	0.544 U	0.509 U	0.620 U	0.511 U	0.547 U	0.527 U	0.605 U	0.614 U	0.604 U	0.589 U	0.562 U
Silver (mg/kg)	4.2	1.3 U	1.1 U		1.2 U	0.661 U	0.607 U	0.563 U	0.613 U	0.600 U	0.540 U	0.544 U	0.509 U	0.620 U	0.511 U	0.547 U	0.527 U	0.605 U	0.614 U	0.604 U	0.589 U	0.562 U
Sodium (mg/kg)		303 JQ	209 JQ		230 JQ																	
Thallium (mg/kg)	0.78	4.5	2.4 JQ		1.6 JQ	0.661 U	0.607 U	0.563 U	0.613 U	0.600 U	0.540 U	0.544 U	0.509 U	0.620 U	0.511 U	0.547 U	0.527 U	0.605 U	0.614 U	0.604 U	0.589 U	0.562 U
Vanadium (mg/kg)	7.8	69.3	27.7		23.6																	
Zinc (mg/kg)	46	68.2 J	28.6		19.3	61.7	23.9	44.3	24.7	166	24.9	67.2	34.8	204	27.0	30.5	22.7	31.7	48.1	26.2	291	48.0
Organometallics																						
Tributyltin (mg/kg)	18					0.00074 U	0.0008 U			0.00079 U	0.00069 U	0.0014 U	0.0014 U	0.0016 U	0.0015 U	0.00074 U	0.00072 U	0.0016 U	0.0016 U	0.0014 U	0.00072 U	0.00076 U
Conventional Chemistry Parameters																						
Dry Weight (Percent)						75.7	82.4	88.8	81.6	83.3	92.6	87.5	91.0	80.6	86.6	87.0	94.0	87.9	82.3	87.2	84.9	83.9
Total Organic Carbon (Percent)																						
Total Solids (Percent)						75.7	82.4	88.8	81.6	83.3	92.6	87.5	91.0			87.0	94.0	87.3	82.3	87.2	84.9	83.9
Polycyclic Aromatic Hydrocarbons (PAHs)																						
Acenaphthene (mg/kg)	3,400	0.0012 J	0.0015		0.0011 U	0.0132 U	0.0120 U	0.671	0.0123 U	18.5	0.0108	7.31	22.0	0.612 U	0.0205	0.0230 U	31.2	0.114 U	0.243 U	0.566 U	0.969 U	1.48 U
Acenaphthylene (mg/kg)	682	0.0011 J	0.0019		0.0011 U	0.0132 U	0.0120 U	4.36	0.0123 U	233	0.0151	5.16	1.49	4.52	0.0114 U	0.0490	460	0.611	0.243 U	0.566 U	0.969 U	10.4
Anthracene (mg/kg)	17,000	0.0014	0.0012		0.0011 U	0.0132 U	0.0120 U	2.36	0.0123 U	274	0.0108 U	29.9	13.0	11.1	0.0198	0.0613	233	0.774	0.243 U	0.566 U	1.47	14.9
Benzo(g,h,i)perylene (mg/kg)	119	0.0029	0.0027		0.0014	0.0132 U	0.0120 U	10.6	0.0123 U	31.9	0.0108 U	9.03	4.04	14.6	0.0114 U	0.0398	79.0	0.159	1.98	0.604	0.969 U	39.5
Dibenzofuran (mg/kg)	78	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Fluoranthene (mg/kg)	2,300	0.0036	0.0028		0.0011 U	0.0132 U	0.0120 U	15.0	0.0123 U	176	0.0108 U	56.2	23.6	68.3	0.0122	0.123	572	2.99	3.22	3.73 U	0.969 U	79.1
Fluorene (mg/kg)	2,300	0.0012 J	0.0013		0.0011 U	0.0132 U	0.0120 U	1.27	0.0123 U	182	0.0130	23.8	15.7	4.57	0.0114 U	0.0659	404	0.798	0.243 U	4.06	0.969 U	1.48 U
Phenanthrene (mg/kg)	45.7	0.0053	0.004		0.0011 U	0.0132 U	0.0120 U	9.16	0.0123 U	480	0.0122	114	55.2	59.7	0.0843	0.253	1,490	2.99	0.648	12.4	4.21	19.6
Pyrene (mg/kg)	1,700	0.0048	0.0039		0.0011 U	0.0132 U	0.0120 U	27.3	0.0123 U	192	0.0108 U	93.8	34.0	95.7	0.0137	0.161	913	1.53	4.33	5.77	1.96	159
1-Methylnaphthalene (mg/kg)	16					0.0132 U	0.0120 U	1.23	0.0123 U	236	0.0144	21.2	51.8	0.979	0.0228	0.0230 U	615	1.13	0.243 U	45.2	0.969 U	1.48 U
2-Methylnaphthalene (mg/kg)	230	0.0053	0.0023		0.0011 U	0.0132 U	0.0120 U	2.96	0.0123 U	404	0.0158	35.1	91.0	1.63	0.0114 U	0.0245	978	1.79	0.243 U	59.2	0.969 U	1.48 U
Naphthalene (mg/kg)	3.6	0.013 J	0.005		0.0011 U	0.00607 U	0.00552 U	4.62	0.00576 U	708	0.0360	63.9	79.8	2.08	0.0319	0.00639 U	953	1.49	0.243 U	14.7	0.623 U	0.00535 U
Benz(a)anthracene (mg/kg)	0.15	0.0022	0.0011 J		0.0011 U	0.0132 U	0.0120 U	5.44	0.0123 U	59.7	0.0108 U	11.8	5.03	21.0	0.0114 U	0.0475	113	0.265	1.22	1.21	1.47 U	37.6
Benzo(a)pyrene (mg/kg)	0.015	0.0025	0.0019		0.0011 U	0.0132 U	0.0120 U	11.5	0.0123 U	58.9	0.0108 U	11.9	6.81	16.7	0.0114 U	0.0782	116	0.394	1.78	1.85	2.84	47.0
Benzo(b)fluoranthene (mg/kg)	0.15	0.0014 J	0.00085 J		0.0011 U	0.0132 U	0.0120 U	6.94	0.0123 U	26.1	0.0108 U	5.93	2.62	12.5	0.0114 U	0.0368	57.4	0.152	1.22	0.754	1.47 U	27.3
Benzo(k)fluoranthene (mg/kg)	1.5	0.0016 J	0.001 J		0.0011 U	0.0176	0.0120 U	6.00	0.0123 U	34.9	0.0130	7.93	3.83	14.6	0.0129	0.0536	60.6	0.250	1.49	1.24	1.76	29.0
Chrysene (mg/kg)	15	0.003	0.0016		0.0011 U	0.0132 U	0.0120 U	9.17	0.0123 U	69.2	0.0108 U	13.7	6.66	28.9	0.0114 U	0.0644	146	0.349	2.03	1.58	1.47 U	53.1
Dibenzo(a,h)anthracene (mg/kg)	0.015	0.0026	0.0022		0.00096 J	0.0132 U	0.0120 U	2.09	0.0123 U	8.48	0.0108 U	2.35	1.28	4.37	0.0114 U	0.0245	22.8	0.114 U	0.486	0.566 U	1.47 U	10.3
Indeno(1,2,3-cd)pyrene (mg/kg)	0.15	0.0028	0.0025		0.001 J	0.0132 U	0.0120 U	6.49	0.0123 U	26.8	0.0108 U	6.31	2.91	11.1	0.0114 U	0.0368	58.5	0.129	1.52	0.604	1.47 U	28.7
Total cPAHs TEQ (ND = 0) (mg/kg)	0.015	0.00359	0.00268		0.0002 J	0.00176	ND	14.3	ND	75.2	0.0013	15.5	8.44	23.3	0.00129	0.0988	149	0.477	2.39	2.25	3.02	60.8
Total cPAHs TEQ (ND = 1/2 RDL) (mg/kg)	0.015	0.00359	0.00268		0.00092 J	0.0111	ND	14.3	ND	75.2	0.00891	15.5	8.44	23.3	0.00933	0.0988	149	0.483	2.39	2.27	3.32	60.8

Table F-2 - Soil Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	MP04 5/13/08 (25-26.5ft)	MP04 5/12/08 (35-37.5ft)	MP04 5/13/08 (35-37.5ft)	MP04 5/13/08 (38.5-40ft)	MW-1 5/21/07 (5-6.5ft)	MW-1 5/21/07 (35-36.5ft)	MW-2 5/21/07 (10-11.5ft)	MW-2 5/21/07 (40-41.5ft)	MW-3 5/22/07 (5-6.5ft)	MW-3 5/22/07 (25-26.5ft)	MW-4 5/23/07 (15-16.5ft)	MW-4 5/23/07 (30-31.5ft)	MW-5 5/24/07 (10-11.5ft)	MW-5 5/24/07 (20-21.5ft)	MW-6 5/22/07 (5-6.5ft)	MW-6 5/22/07 (10-11.5ft)	MW-6 5/22/07 (35-36.5ft)	MW-7 5/23/07 (5-6.5ft)	MW-7 5/23/07 (25-26.5ft)	MW-8 5/22/07 (10-11.5ft)	MW-8 5/22/07 (25-26.5ft)
Other (Non-PAH) Semivolatiles																						
1,1'-Biphenyl (mg/kg)	51	0.025 U	0.024 U		0.023 U																	
1,2,4,5-Tetrachlorobenzene (mg/kg)	18	0.025 U	0.024 U		0.023 U																	
1,4-Dioxane (mg/kg)	4.6	0.12 U	0.12 U		0.13 U																	
2,3,4,6-Tetrachlorophenol (mg/kg)	1,800	0.025 U	0.024 U		0.023 U																	
2,4,5-Trichlorophenol (mg/kg)	6,100	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
2,4,6-Trichlorophenol (mg/kg)	44	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
2,4-Dichlorophenol (mg/kg)	180	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
2,4-Dimethylphenol (mg/kg)	1,200	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
2,4-Dinitrophenol (mg/kg)	120	0.12 UJ	0.12 UJ		0.11 UJ	0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U
2-Chloronaphthalene (mg/kg)	6,300	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
2-Chlorophenol (mg/kg)	390	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
2-Methylphenol (mg/kg)	3,100					0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
2-Nitroaniline (mg/kg)	610	0.05 U	0.047 U		0.047 U	0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U
2-Nitrophenol (mg/kg)	1.6	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
3 & 4 Methylphenol (mg/kg)						0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
3,3'-Dichlorobenzidine (mg/kg)	1.1	0.025 U	0.024 U		0.023 U	6.61 U	5.99 U	28.0 U	6.13 U	1,500 U	5.40 U	57.7 U	106 U	61.2 U	5.70 U	11.5 U	2,630 U	5.69 U	6.08 U	56.6 U	14.7 U	148 U
3-Nitroaniline (mg/kg)	3.16	0.05 U	0.047 U		0.047 U	0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U
4,6-Dinitro-2-methylphenol (mg/kg)	4.9	0.05 U	0.047 U		0.047 U	0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U
4-Bromophenyl phenyl ether (mg/kg)		0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
4-Chloro-3-methylphenol (mg/kg)	6,100	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
4-Chloroaniline (mg/kg)	2.4	0.025 U	0.024 U		0.023 U	0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U
4-Chlorophenyl phenyl ether (mg/kg)		0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
4-Methylphenol (mg/kg)	6,100	0.025 U	0.024 U		0.023 U																	
4-Nitroaniline (mg/kg)	24	0.05 U	0.047 U		0.047 U	0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U
4-Nitrophenol (mg/kg)	5.12	0.05 U	0.047 U		0.047 U	0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U
Acetophenone (mg/kg)	7,800	0.025 U	0.024 U		0.023 U																	
Aniline (mg/kg)	85					0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Atrazine (mg/kg)	2.1	0.025 U	0.024 U		0.023 U																	
Benzaldehyde (mg/kg)	7,800	0.025 U	0.024 U		0.023 U																	
Benzidine (mg/kg)	0.0005	0.025 U	0.024 U		0.023 U																	
Benzoic acid (mg/kg)	240,000					1.32 U	1.20 U	5.59 U	1.23 U	299 U	1.08 U	11.5 U	21.3 U	12.2 U	1.14 U	2.30 U	527 U	1.14 U	1.22 U	11.3 U	2.93 U	29.7 U
Benzyl alcohol (mg/kg)	6,100					0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Benzyl butyl phthalate (mg/kg)	260	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Bis(2-chloro-1-methylethyl) ether (mg/kg)	4.6	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Bis(2-chloroethoxy)methane (mg/kg)	180	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Bis(2-chloroethyl) ether (mg/kg)	0.21	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Bis(2-ethylhexyl) phthalate (mg/kg)	35	0.24	0.069		0.16	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Caprolactam (mg/kg)	30,000	0.025 U	0.024 U		0.023 U																	
Carbazole (mg/kg)		0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Diethyl phthalate (mg/kg)	49,000	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Dimethyl phthalate (mg/kg)	734	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Di-n-butyl phthalate (mg/kg)	6,100	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Di-n-octyl phthalate (mg/kg)	610	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Hexachlorobenzene (mg/kg)	0.3	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Hexachlorocyclopentadiene (mg/kg)	370	0.062 UJ	0.059 UJ		0.059 UJ	0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U
Hexachloroethane (mg/kg)	12	0.0024 U	0.0024 U		0.0026 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Isophorone (mg/kg)	510	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	6.30	0.969 U	9.80 U
Nitrobenzene (mg/kg)	4.8					0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
N-Nitrosodimethylamine (mg/kg)	0.0023	0.025 U	0.024 U		0.023 U																	
N-Nitroso-di-n-propylamine (mg/kg)	0.069	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
N-Nitrosodiphenylamine (mg/kg)	99	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
Pentachlorophenol (mg/kg)	0.89	0.0036	0.0023 U		0.00081 J	0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U
Phenol (mg/kg)	18,000	0.025 U	0.024 U		0.023 U	0.436 U	0.395 U	1.85 U	0.404 U	98.7 U	0.356 U	3.81 U	7.02 U	4.04 U	0.376 U	0.759 U	174 U	0.375 U	0.401 U	3.73 U	0.969 U	9.80 U
2,4-Dinitrotoluene (mg/kg)	1.6					0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U
2,6-Dinitrotoluene (mg/kg)	0.0328					0.661 U	0.599 U	2.80 U	0.613 U	150 U	0.540 U	5.77 U	10.6 U	6.12 U	0.570 U	1.15 U	263 U	0.569 U	0.608 U	5.66 U	1.47 U	14.8 U

Table F-2 - Soil Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	MP04 5/13/08 (25-26.5ft)	MP04 5/12/08 (35-37.5ft)	MP04 5/13/08 (35-37.5ft)	MP04 5/13/08 (38.5-40ft)	MW-1 5/21/07 (5-6.5ft)	MW-1 5/21/07 (35-36.5ft)	MW-2 5/21/07 (10-11.5ft)	MW-2 5/21/07 (40-41.5ft)	MW-3 5/22/07 (5-6.5ft)	MW-3 5/22/07 (25-26.5ft)	MW-4 5/23/07 (15-16.5ft)	MW-4 5/23/07 (30-31.5ft)	MW-5 5/24/07 (10-11.5ft)	MW-5 5/24/07 (20-21.5ft)	MW-6 5/22/07 (5-6.5ft)	MW-6 5/22/07 (10-11.5ft)	MW-6 5/22/07 (35-36.5ft)	MW-7 5/23/07 (5-6.5ft)	MW-7 5/23/07 (25-26.5ft)	MW-8 5/22/07 (10-11.5ft)	MW-8 5/22/07 (25-26.5ft)
Volatile Organic Compounds (VOC)																						
1,1,1,2-Tetrachloroethane (mg/kg)	1.9	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
1,1,1-Trichloroethane (mg/kg)	8,700	0.0012 U	0.0012 U		0.0013 U	0.00152 U	0.00138 U	0.101 U	0.00144 U	0.553 U	0.00145 U	0.417 U	0.0833 U	0.112 U	0.0014 U	0.0016 U	3.60 U	0.00197 U	0.102 U	0.117 U	0.125 U	0.00134 U
1,1,2 - Trichlorotrifluoroethane (mg/kg)	43,000	0.0012 U	0.0012 U		0.0013 U																	
1,1,2,2-Tetrachloroethane (mg/kg)	0.56	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
1,1,2-Trichloroethane (mg/kg)	1.1	0.0012 U	0.0012 U		0.0013 U	0.00076 U	0.00069 U	0.101 U	0.00072 U	0.553 U	0.00073 U	0.417 U	0.0833 U	0.112 U	0.0007 U	0.0008 U	3.60 U	0.00099 U	0.102 U	0.117 U	0.125 U	0.00067 U
1,1-Dichloroethane (mg/kg)	3.3	0.0012 U	0.0012 U		0.0013 U	0.00121 U	0.0011 U	0.101 U	0.00115 U	0.553 U	0.00116 U	0.417 U	0.0833 U	0.112 U	0.00112 U	0.00128 U	3.60 U	0.00158 U	0.102 U	0.117 U	0.125 U	0.00107 U
1,1-Dichloroethene (mg/kg)	240	0.0012 U	0.0012 U		0.0013 U	0.00182 U	0.00165 U	0.101 U	0.00173 U	0.553 U	0.00174 U	0.417 U	0.0833 U	0.112 U	0.00168 U	0.00192 U	3.60 U	0.00236 U	0.102 U	0.117 U	0.125 U	0.00161 U
1,1-Dichloropropene (mg/kg)						0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
1,2,3-Trichlorobenzene (mg/kg)	49	0.00013 J	0.0061 U		0.0064 U	0.00607 U	0.00552 U	0.504 U	0.00576 U	2.77 U	0.0058 U	2.09 U	0.416 U	0.562 U	0.0056 U	0.00639 U	18.0 U	0.00788 U	0.511 U	0.587 U	0.623 U	0.00535 U
1,2,3-Trichloropropane (mg/kg)	0.005	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
1,2,4-Trichlorobenzene (mg/kg)	22	0.00014 J	0.0061 U		0.0064 U	0.00607 U	0.00552 U	0.504 U	0.00576 U	2.77 U	0.0058 U	2.09 U	0.416 U	0.562 U	0.0056 U	0.00639 U	18.0 U	0.00788 U	0.511 U	0.587 U	0.623 U	0.00535 U
1,2,4-Trimethylbenzene (mg/kg)	62	0.025 U	0.024 U		0.023 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	6.70	0.0029 U	1.92	8.31	0.112 U	0.0028 U	0.00319 U	13.2	0.00394 U	0.103	6.85	0.125 U	0.00268 U
1,2-Dibromo-3-chloropropane (mg/kg)	0.0054	0.0012 U	0.0012 U		0.0013 U	0.00607 U	0.00552 U	0.504 U	0.00576 U	2.77 U	0.0058 U	2.09 U	0.416 U	0.562 U	0.0056 U	0.00639 U	18.0 U	0.00788 U	0.511 U	0.587 U	0.623 U	0.00535 U
1,2-Dibromoethane (EDB) (mg/kg)	0.034	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
1,2-Dichlorobenzene (mg/kg)	1,900	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
1,2-Dichloroethane (EDC) (mg/kg)	0.43	0.0012 U	0.0012 U		0.0013 U	0.00076 U	0.00069 U	0.101 U	0.00072 U	0.553 U	0.00073 U	0.417 U	0.0833 U	0.112 U	0.0007 U	0.0008 U	3.60 U	0.00099 U	0.102 U	0.117 U	0.125 U	0.00067 U
1,2-Dichloropropane (mg/kg)	0.94	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
1,3,5-Trimethylbenzene (mg/kg)	780	0.025 U	0.024 U		0.023 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	2.41	0.0029 U	0.426	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.67	0.00394 U	0.102 U	0.927	0.125 U	0.00268 U
1,3-Dichlorobenzene (mg/kg)	37.7	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
1,3-Dichloropropane (mg/kg)	1,600					0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
1,4-Dichlorobenzene (mg/kg)	2.4	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
1,4-Difluorobenzene (mg/kg)								2.00														
2,2-Dichloropropane (mg/kg)						0.00607 U	0.00552 U	0.101 U	0.00576 U	0.553 U	0.0058 U	0.417 U	0.0833 U	0.112 U	0.0056 U	0.00639 U	3.60 U	0.00788 U	0.102 U	0.117 U	0.125 U	0.00535 U
2-Butanone (mg/kg)	28,000	0.0061 U	0.0061 U		0.0064 U	0.00911 U	0.00827 U	1.01 U	0.00864 U	5.53 U	0.0087 U	4.17 U	0.833 U	1.12 U	0.0084 U	0.00958 U	36.0 U	0.0118 U	1.02 U	1.17 U	1.25 U	0.00803 U
2-Chlorotoluene (mg/kg)	1,600					0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
2-Hexanone (mg/kg)	12.6	0.0061 UJ	0.0061 UJ		0.0064 UJ	0.0121 U	0.011 U	1.01 U	0.0115 U	5.53 U	0.0116 U	4.17 U	0.833 U	1.12 U	0.0112 U	0.0128 U	36.0 U	0.0158 U	1.02 U	1.17 U	1.25 U	0.0107 U
4-Chlorotoluene (mg/kg)	1,600					0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
4-Methyl-2-pentanone (mg/kg)	5,300	0.0061 U	0.0061 U		0.0064 U	0.0121 U	0.011 U	1.01 U	0.0115 U	5.53 U	0.0116 U	4.17 U	0.833 U	1.12 U	0.0112 U	0.0128 U	36.0 U	0.0158 U	1.02 U	1.17 U	1.25 U	0.0107 U
Acetone (mg/kg)	61,000	0.0061 U	0.016		0.018	0.0182 U	0.0165 U	1.01 U	0.0173 U	5.53 U	0.0233	4.17 U	0.833 U	1.12 U	0.0168 U	0.0192 U	36.0 U	0.0236 U	1.02 U	1.17 U	1.25 U	0.0161 U
Benzene (mg/kg)	1.1	0.0012 U	0.0012 U		0.0013 U	0.00091 U	0.00083 U	0.139	0.00086 U	1.93	0.00087 U	0.417 U	0.0167 U	0.0416	0.00779	0.00096 U	0.719 U	0.00722	0.102 U	0.117 U	0.0249 U	0.0008 U
Bromobenzene (mg/kg)	300					0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Bromochloromethane (mg/kg)	160	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Bromodichloromethane (mg/kg)	0.27	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Bromoform (mg/kg)	15.9	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Bromomethane (mg/kg)	7.3	0.0012 U	0.0012 U		0.0013 U	0.00607 U	0.00552 U	0.101 U	0.00576 U	0.553 U	0.0058 U	0.417 U	0.0833 U	0.112 U	0.0056 U	0.00639 U	3.60 U	0.00788 U	0.102 U	0.117 U	0.125 U	0.00535 U
Carbon disulfide (mg/kg)	820	0.0012 U	0.0012 U		0.0013 U	0.00182 U	0.00165 U	0.101 U	0.00173 U	0.553 U	0.00174 U	0.417 U	0.0833 U	0.112 U	0.00168 U	0.00192 U	3.60 U	0.00236 U	0.102 U	0.117 U	0.125 U	0.00161 U
Carbon tetrachloride (mg/kg)	0.61	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Chlorobenzene (mg/kg)	290	0.0012 U	0.0012 U		0.0013 U	0.00121 U	0.0011 U	0.101 U	0.00115 U	0.553 U	0.00116 U	0.417 U	0.0833 U	0.112 U	0.00112 U	0.00128 U	3.60 U	0.00158 U	0.102 U	0.117 U	0.125 U	0.00107 U
Chlorobenzene-d5 (mg/kg)								2.00														
Chloroethane (mg/kg)	15,000	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Chloroform (mg/kg)	0.29	0.0012 U	0.0012 U		0.0013 U	0.00152 U	0.00138 U	0.101 U	0.00144 U	0.553 U	0.00145 U	0.417 U	0.0833 U	0.112 U	0.0014 U	0.0016 U	3.60 U	0.00197 U	0.102 U	0.117 U	0.125 U	0.00134 U
Chloromethane (mg/kg)	120	0.0012 U	0.0012 U		0.0013 U	0.00607 U	0.00552 U	0.504 U	0.00576 U	2.77 U	0.0058 U	2.09 U	0.416 U	0.562 U	0.0056 U	0.00639 U	18.0 U	0.00788 U	0.511 U	0.587 U	0.623 U	0.00535 U
cis-1,2-Dichloroethene (DCE) (mg/kg)	160	0.0012 U	0.0012 U		0.0013 U	0.00182 U	0.00165 U	0.101 U	0.00173 U	0.553 U	0.00174 U	0.417 U	0.0833 U	0.112 U	0.00168 U	0.00192 U	3.60 U	0.00236 U	0.102 U	0.117 U	0.125 U	0.00161 U
cis-1,3-Dichloropropene (mg/kg)	0.398	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Cyclohexane (mg/kg)	7,000	0.0012 U	0.0012 U		0.0013 U																	
Dibromochloromethane (mg/kg)	0.68	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Dibromomethane (mg/kg)	25					0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Dichlorodifluoromethane (mg/kg)	94	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Ethylbenzene (mg/kg)	5.4	0.0012 U	0.0012 U		0.0013 U	0.00243 U	0.00221 U	0.295	0.0023 U	3.29	0.00232 U	0.893	1.80	0.112 U	0.011	0.00255 U	3.60 U	0.00475	0.102 U	0.250	0.125 U	0.00214 U
Hexachlorobutadiene (mg/kg)	6.2	0.0012 U	0.0012 U		0.0013 U	0.00607 U	0.00552 U	0.504 U	0.00576 U	2.77 U	0.0058 U	2.09 U	0.416 U	0.562 U	0.0056 U	0.00639 U	18.0 U	0.00788 U	0.401 U	0.587 U	0.623 U	0.00535 U
Isopropylbenzene (mg/kg)	2,100	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.600	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.418	0.125 U	0.00268 U
Methyl acetate (mg/kg)	78,000	0.0012 U	0.0012 U		0.0013 U																	
Methyl tert-butyl ether (MTBE) (mg/kg)	43	0.0012 U	0.0012 U		0.0013 U	0.00061 U	0.00055 U	0.504 U	0.00058 U	2.77 U	0.00058 U	2.09 U	0.416 U	0.562 U	0.00056 U	0.00064 U	18.0 U	0.00079 U	0.511 U	0.587 U	0.623 U	0.00054 U
Methylcyclohexane (mg/kg)		0.0012 U	0.0012 U		0.0013 U																	
Methylene chloride (mg/kg)	56	0.0012 U	0.0012 U		0.0013 U	0.00212 U	0.0108	1.01 U	0.00202 U	5.53 U	0.00203 U	4.17 U	0.833 U	1.12 U	0.00196 U	0.00223 U	36.0 U	0.00276 U	1.02 U	1.17 U	1.25 U	0.00187 U
n-Butylbenzene (mg/kg)	3,900					0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	1.96	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	1.78	0.125 U	0.00268 U
n-Hexane (mg/kg)	570					0.00121 U	0.00121	1.01 U	0.00115 U	5.53 U	0.00116 U	4.17 U	0.833 U	1.12 U	0.00112 U	0.00128 U	36.0 U	0.00158 U	1.02 U	1.17 U	1.25 U	0.00107 U

Table F-2 - Soil Quality Data
Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	MP04 5/13/08 (25-26.5ft)	MP04 5/12/08 (35-37.5ft)	MP04 5/13/08 (35-37.5ft)	MP04 5/13/08 (38.5-40ft)	MW-1 5/21/07 (5-6.5ft)	MW-1 5/21/07 (35-36.5ft)	MW-2 5/21/07 (10-11.5ft)	MW-2 5/21/07 (40-41.5ft)	MW-3 5/22/07 (5-6.5ft)	MW-3 5/22/07 (25-26.5ft)	MW-4 5/23/07 (15-16.5ft)	MW-4 5/23/07 (30-31.5ft)	MW-5 5/24/07 (10-11.5ft)	MW-5 5/24/07 (20-21.5ft)	MW-6 5/22/07 (5-6.5ft)	MW-6 5/22/07 (10-11.5ft)	MW-6 5/22/07 (35-36.5ft)	MW-7 5/23/07 (5-6.5ft)	MW-7 5/23/07 (25-26.5ft)	MW-8 5/22/07 (10-11.5ft)	MW-8 5/22/07 (25-26.5ft)
n-Propylbenzene (mg/kg)	3,400					0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.952	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.792	0.125 U	0.00268 U
Pentafluorobenzene (mg/kg)								2.00						2.00	0.04							
p-Isopropyltoluene (mg/kg)						0.00304 U	0.00276 U	0.101 U	0.00288 U	0.808	0.0029 U	0.493	1.49	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	1.65	0.125 U	0.00268 U
sec-Butylbenzene (mg/kg)	7,800					0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.748	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.915	0.125 U	0.00268 U
Styrene (mg/kg)	6,300	0.0012 U	0.0012 U		0.0013 U	0.00061 U	0.00055 U	0.101 U	0.00058 U	0.553 U	0.00058 U	0.417 U	0.0833 U	0.112 U	0.00056 U	0.00064 U	3.60 U	0.00079 U	0.102 U	0.117 U	0.125 U	0.00081
tert-Butylbenzene (mg/kg)	7,800					0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Tetrachloroethene (PCE) (mg/kg)	22	0.0012 U	0.0012 U		0.0013 U	0.00121 U	0.0011 U	0.101 U	0.00115 U	0.553 U	0.00116 U	0.417 U	0.0833 U	0.112 U	0.00112 U	0.00128 U	3.60 U	0.00158 U	0.102 U	0.117 U	0.125 U	0.00107 U
Toluene (mg/kg)	5,000	0.0012 U	0.0012 U		0.0013 U	0.00091 U	0.00083 U	0.101 U	0.00086 U	1.41	0.00087 U	0.417 U	0.0833 U	0.143	0.00084 U	0.00096 U	5.00	0.00118 U	0.198	0.117 U	0.125 U	0.0008 U
trans-1,2-Dichloroethene (mg/kg)	150	0.0012 U	0.0012 U		0.0013 U	0.00152 U	0.00138 U	0.101 U	0.00144 U	0.553 U	0.00145 U	0.417 U	0.0833 U	0.112 U	0.0014 U	0.0016 U	3.60 U	0.00197 U	0.102 U	0.117 U	0.125 U	0.00134 U
trans-1,3-Dichloropropene (mg/kg)	0.398	0.0012 U	0.0012 U		0.0013 U	0.00076 U	0.00069 U	0.101 U	0.00072 U	0.553 U	0.00073 U	0.417 U	0.0833 U	0.112 U	0.0007 U	0.0008 U	3.60 U	0.00099 U	0.102 U	0.117 U	0.125 U	0.00067 U
Trichloroethene (TCE) (mg/kg)	0.91	0.0012 U	0.0012 U		0.0013 U	0.00152 U	0.00147	0.101 U	0.00144 U	0.553 U	0.00145 U	0.417 U	0.0833 U	0.112 U	0.0014 U	0.0016 U	3.60 U	0.00197 U	0.102 U	0.117 U	0.125 U	0.00134 U
Trichlorofluoromethane (mg/kg)	790	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U	0.101 U	0.00288 U	0.553 U	0.0029 U	0.417 U	0.0833 U	0.112 U	0.0028 U	0.00319 U	3.60 U	0.00394 U	0.102 U	0.117 U	0.125 U	0.00268 U
Vinyl chloride (mg/kg)	0.06	0.0012 U	0.0012 U		0.0013 U	0.00152 U	0.00138 U	0.101 U	0.00144 U	0.553 U	0.00145 U	0.417 U	0.0833 U	0.112 U	0.0014 U	0.0016 U	3.60 U	0.00197 U	0.102 U	0.117 U	0.125 U	0.00134 U
m,p-Xylenes (mg/kg)	630	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U		0.00288 U		0.0029 U				0.0028 U	0.00319 U		0.00394 U				0.00268 U
o-Xylene (mg/kg)	690	0.0012 U	0.0012 U		0.0013 U	0.00304 U	0.00276 U		0.00288 U		0.0029 U				0.0028 U	0.00319 U		0.00394 U				0.00268 U
Xylenes (total) (mg/kg)	630					0.00607 U	0.00552 U	0.353	0.00576 U	8.71	0.0058 U	1.51	2.60	0.337 U	0.0056 U	0.00639 U	16.7	0.00788 U	0.363	0.421	0.374 U	0.00535 U
Polychlorinated Biphenyls (PCBs)																						
Aroclor 1016 (mg/kg)	3.9					0.0328 U	0.0304 U	0.0281 U	0.0308 U	0.0588 U	0.0273 U	0.0587 U	0.0553 U	0.0642 U	0.0289 U	0.0288 U	0.0508 U	0.0554 U	0.0301 U	0.0289 U	0.0291 U	0.0301 U
Aroclor 1221 (mg/kg)	0.14					0.0656 U	0.0609 U	0.0561 U	0.0617 U	0.118 U	0.0545 U	0.117 U	0.111 U	0.128 U	0.0577 U	0.0577 U	0.102 U	0.111 U	0.0602 U	0.0577 U	0.0581 U	0.0602 U
Aroclor 1232 (mg/kg)	0.14					0.0328 U	0.0304 U	0.0281 U	0.0308 U	0.0588 U	0.0273 U	0.0587 U	0.0553 U	0.0642 U	0.0289 U	0.0288 U	0.0508 U	0.0554 U	0.0301 U	0.0289 U	0.0291 U	0.0301 U
Aroclor 1242 (mg/kg)	0.22					0.0328 U	0.0304 U	0.0281 U	0.0308 U	0.0588 U	0.0273 U	0.0587 U	0.0553 U	0.0642 U	0.0289 U	0.0288 U	0.0508 U	0.0554 U	0.0301 U	0.0289 U	0.0291 U	0.0301 U
Aroclor 1248 (mg/kg)	0.22					0.0328 U	0.0304 U	0.0281 U	0.0308 U	0.0588 U	0.0273 U	0.0587 U	0.0553 U	0.0642 U	0.0289 U	0.0288 U	0.0508 U	0.0554 U	0.0301 U	0.0289 U	0.0291 U	0.0301 U
Aroclor 1254 (mg/kg)	0.22					0.0328 U	0.0304 U	0.0281 U	0.0308 U	0.0588 U	0.0273 U	0.0587 U	0.0553 U	0.0642 U	0.0289 U	0.0288 U	0.0508 U	0.0554 U	0.0301 U	0.0289 U	0.0291 U	0.0301 U
Aroclor 1260 (mg/kg)	0.22					0.0328 U	0.0304 U	0.0281 U	0.0308 U	0.0588 U	0.0273 U	0.0587 U	0.0553 U	0.0642 U	0.0289 U	0.0288 U	0.0508 U	0.0554 U	0.0301 U	0.0289 U	0.0291 U	0.0301 U
Aroclor 1262 (mg/kg)						0.0328 U	0.0304 U	0.0281 U	0.0308 U	0.0588 U	0.0273 U	0.0587 U	0.0553 U	0.0642 U	0.0289 U	0.0288 U	0.0508 U	0.0554 U	0.0301 U	0.0289 U	0.0291 U	0.0301 U
Aroclor 1268 (mg/kg)						0.0328 U	0.0304 U	0.0281 U	0.0308 U	0.0588 U	0.0273 U	0.0587 U	0.0553 U	0.0642 U	0.0289 U	0.0288 U	0.0508 U	0.0554 U	0.0301 U	0.0289 U	0.0291 U	0.0301 U

Table F-2 - Soil Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	SP01 5/12/08 (3.5-5ft)	SP01 5/12/08 (8.5-10ft)	SP01 5/12/08 (13.5-15ft)	SP01 5/12/08 (18.5-20ft)	SP02 5/12/08 (0-5ft)	SP02 5/12/08 (10-11.5ft)	SP02 5/12/08 (12.5-14ft)	SP02 5/12/08 (18.5-20ft)	SP02 5/12/08 (23.5-25ft)	SP02 5/12/08 (28.5-30ft)	SP03 5/12/08 (4.3-5ft)	SP03 5/12/08 (5-6.5ft)	SP03 5/12/08 (13.5-15ft)	SP03 5/12/08 (18.5-20ft)	SP03 5/12/08 (23.5-25ft)	SP03 5/12/08 (28.5-30ft)	SP03 5/12/08 (33.5-35ft)	SP03 5/12/08 (38.5-40ft)	SP03 5/12/08 (43.5-45ft)
Total Petroleum Hydrocarbons (TPH)																				
Gasoline Range Hydrocarbons (mg/kg)		5 U	6 U	5 U	5 U	6 U	6 U	7 U	6 U	6 U	6 U	200 J	30,000 U		9	6 U	11 U	8 U	6 U	
Diesel Range Hydrocarbons (mg/kg)		25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	100 U	36,000 J		25 U	25 U	25 U	25 U	25 U	
Oil Range Hydrocarbons (mg/kg)		50 U	50 U	50 U	50 U	50 U	50 U	52	50 U	50 U	50 U	4,700 J	29,000 J		50 U	50 U	50 U	50 U	50 U	
Metals																				
Aluminum (mg/kg)	77,000	16,500 J	10,700 J	8,370 J	20,500 J	24,100 J	20,600 J	20,100 J	20,800 J	7,280 J	7,380	14,900	5,780	14,700	18,200	19,600	22,000	22,500	19,600	8,430
Antimony (mg/kg)	0.27										7.3 UJ	7.2 UJ	1.2 J	6 UJ	7.5 UJ	7.6 UJ	7.7 UJ	7.9 UJ	7.5 UJ	7.1 UJ
Arsenic (mg/kg)	0.61	2.1	1.1	1.8	1.5	2	3.7	2.7	1.4		1.3	4.2	7.8		3.9	1.2	2.5	4.6	2.2	0.6
Barium (mg/kg)	330	70.4 J	44.6 J	43.4 J	88.6 J	120 J	103 J	100 J	95.6 J	34.4 J	28.5	71.3	74.1	63.9	94	101	110	113	93.9	31.3
Beryllium (mg/kg)	21	0.3 JQ	0.2 JQ	0.2 JQ	0.5 JQ	0.4 JQ	0.5 JQ	0.4 JQ	0.5 JQ	0.2 JQ	0.2 JQ	0.3 JQ	0.1 JQ	0.3 JQ	0.4 JQ	0.4 JQ	0.5 JQ	0.5 JQ	0.4 JQ	0.2 JQ
Cadmium (mg/kg)	0.36	0.5 JQ	0.4 JQ	0.3 JQ	0.9	0.7	0.9	0.9	1	0.2 JQ	0.2 JQ	1.2	1.6	0.6	0.9	0.9	1.1	1.2	0.9	0.3 JQ
Calcium (mg/kg)		3,490	3,740	3,270	6,940	3,180	6,400	6,310	7,290	3,180	3,640	7,440	21,300	4,410	7,080	7,250	7,940	7,900	7,230	3,740
Chromium (Total)(mg/kg)	26	33	26	29.1	50.9	43.1	51.8	48.7	60.8	20.1	18.9 J	28.1 J	59.9 J	32 J	48.3 J	46.2 J	53.3 J	54.7 J	46.7 J	21.2 J
Chromium (VI) (mg/kg)	0.29																			
Cobalt (mg/kg)	13	9.2	7.8	9.1	15.7	11.1	17.3	15.7	16.9	5.6 JQ	5.4 JQ	10.3	3.3 JQ	11.9	14.1	15.5	17.3	18.1	15.6	6.4
Copper (mg/kg)	28	19.7	14.2	15	41.6	26.3	42.8	40.9	46.4	11.6	9.5	45.7	62.7	24.6	41.2	43.7	52.1	54	44.5	12.9
Iron (mg/kg)	55,000	18,400 J	15,100 J	13,800 J	29,600 J	24,800 J	34,300 J	32,800 J	32,400 J	11,700 J	11,100	24,300	47,800	21,000	33,000	32,400	36,500	37,200	32,400	13,600
Lead (mg/kg)	11	2.4 J	1.2 J	1.2 U	4.7 J	4.4 J	4.4 J	4.3 J	4.8 J	0.7 JQ	0.6 JQ	31.2	128	2.8	4.5	4.7	5.2	5.4	4.3	0.8 JQ
Magnesium (mg/kg)		5,120 J	4,580 J	4,430 J	9,510 J	5,720 J	8,930 J	8,710 J	11,400 J	5,050 J	4,600	5,130	1,380	5,520	9,970	12,200	14,300	14,900	12,500	4,820
Manganese **(mg/kg)**	220	289 J	276 J	341 J	421 J	307 J	627 J	557 J	449 J	192 J	170	388	215	339	824	520	662	678	515	235
Mercury (mg/kg)	10	0.1 U	0.1 U	0.1 U	0.1 JQ	0.1 U	0.1 U	0.1 JQ	0.1 JQ	0.1 U	0.1 U	0.1 JQ	0.1 JQ	0.1 U	0.1 JQ	0.1 JQ	0.1 JQ	0.1 JQ	0.1 JQ	0.1 U
Nickel (mg/kg)	38	40.4 J	34.1 J	42.5 J	58.2 J	41.6 J	57.8 J	56.7 J	56 J	33.5 J	32.3	60.9	28.4	40.2	52.9	56.5	62.2	65.3	56.2	31.7
Potassium (mg/kg)		505 JQ	431 JQ	407 JQ	1,280	404 JQ	1,090	1,080	1,350	370 JQ	401 JQ	563 JQ	233 JQ	587	1,240	1,570	1,900	2,000	1,690	413 JQ
Selenium (mg/kg)	0.52	4.1 U	3.9 U	4.1 U	4.5 U	4.4 U	4.6 U	4.5 U	4.5 U	4.1 U	4.2 U	4.2 U	5.7 U	3.5 U	4.4 U	4.5 U	4.5 U	4.6 U	4.4 U	4.2 U
Silver (mg/kg)	4.2	1.2 U	1.1 U	1.2 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.2 U	1.2 U	1.2 U	1.6 U	1 U	1.3 U	1.3 U	1.3 U	1.3 U	1.2 U	1.2 U
Sodium (mg/kg)		175 JQ	177 JQ	211 JQ	367 JQ	167 JQ	306 JQ	315 JQ	487 JQ	176 JQ	197 JQ	263 JQ	377 JQ	171 JQ	468 JQ	527 JQ	565 JQ	543 JQ	544 JQ	209 JQ
Thallium (mg/kg)	0.78	3.4	2.8	2.4 JQ	4.5	4.1	5	4.7	5	2.3 JQ	1.8 JQ	3	4.1 U	3.9	5.1	4.6	5.5	5.7	5	2.2 JQ
Vanadium (mg/kg)	7.8	44.7	35.4	31.5	69.9	62.6	85.3	75.1	86	24	25.4	54.1	30.2	47.2	73.4	70.4	77.8	80.1	71.3	29.9
Zinc (mg/kg)	46	34.3 J	29 J	26.2 J	69.2 J	55.9 J	66.4 J	63.9 J	72.3 J	34.7 J	22.3	114	376	44.3	62.7	65.7	76.7	79	67.4	33
Organometallics																				
Tributyltin (mg/kg)	18																			
Conventional Chemistry Parameters																				
Dry Weight (Percent)																				
Total Organic Carbon (Percent)																				
Total Solids (Percent)																				
Polycyclic Aromatic Hydrocarbons (PAHs)																				
Acenaphthene (mg/kg)	3,400	0.0016 U	0.0011 U	0.0047 J	0.0012 U	0.0089	0.0013 U	0.0013 U	0.0013 U	0.0011 U	0.0012 U	0.46	0.053	0.012	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.049
Acenaphthylene (mg/kg)	682	0.0016 U	0.0011 U	0.0012 UJ	0.0012 U	0.0018	0.0013 U	0.00091 J	0.0013 U	0.0011 U	0.0012 U	1.3	1.4	0.13	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0012 U
Anthracene (mg/kg)	17,000	0.0016 U	0.0011 U	0.0041 J	0.0012 U	0.0067	0.0013 U	0.026 U	0.0013 U	0.0011 U	0.0012 U	0.32	0.7	0.018 J	0.026 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.017 J
Benzo(g,h,i)perylene (mg/kg)	119	0.0022	0.0017	0.0037 J	0.00077 J	0.0026	0.0013	0.002	0.0013	0.0011 U	0.0012 U	5.7	25	0.021 J	0.0023	0.0013 U	0.0023	0.0025	0.0023	0.0012 U
Dibenzofuran (mg/kg)	78	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.37	0.063	0.017 J	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Fluoranthene (mg/kg)	2,300	0.0016 U	0.0011 U	0.0053	0.0012 U	0.01	0.0013 U	0.0049	0.0013 U	0.0011 U	0.0012 U	37	22	0.071	0.0071	0.003	0.0013 U	0.0086	0.0059	0.036
Fluorene (mg/kg)	2,300	0.0016 U	0.0011 U	0.0034 J	0.0012 U	0.006	0.0013 U	0.0013 U	0.0007 J	0.0011 U	0.0012 U	1.1	6.9	0.072	0.004	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.023 J
Phenanthrene (mg/kg)	45.7	0.0016 U	0.0011 U	0.011 J	0.00074 J	0.021 J	0.0013 U	0.0023	0.0013 U	0.0011 U	0.0012 U	5.5	29	0.17	0.012	0.0024	0.0013 U	0.0041	0.0022	0.085
Pyrene (mg/kg)	1,700	0.001 J	0.0011 U	0.0073 J	0.0012 U	0.015 J	0.0013 U	0.0083	0.0013 U	0.0011 U	0.0012 U	41	27	0.089	0.0097	0.0043	0.0095	0.011	0.0074	0.041
1-Methylnaphthalene (mg/kg)	16																			
2-Methylnaphthalene (mg/kg)	230	0.0016 U	0.0011 U	0.0031 J	0.0012 U	0.0062	0.0013 U	0.0013 U	0.0013 U	0.0011 U	0.0012 U	6.6	63	0.38	0.17	0.0022	0.0034	0.0059	0.0028	0.079
Naphthalene (mg/kg)	3.6	0.0016 J	0.00062 J	0.003 J	0.00047	0.0059	0.0013 U	0.0013 U	0.00075 J	0.0028	0.0017	8.7	620	1.3	1.3	0.0079	0.01	0.019 J	0.01	0.28
Benz(a)anthracene (mg/kg)	0.15	0.0016 U	0.0011 U	0.0022 J	0.0012 U	0.0044	0.0013 U	0.0035	0.0013 U	0.0011 U	0.0012 U	11	12	0.026	0.003	0.0013 U	0.0026	0.0032	0.0023	0.0012 U
Benzo(a)pyrene (mg/kg)	0.015	0.0011 J	0.0011 U	0.0027 J	0.0012 U	0.0048	0.0013 U	0.0033	0.0013 U	0.0034	0.0012 U	15	30	0.025	0.0035	0.015	0.013	0.01	0.018	0.0012 U
Benzo(b)fluoranthene (mg/kg)	0.15	0.0016 UJ	0.0011 UJ	0.0012 U	0.0012 U	0.0024	0.0013 U	0.0015	0.0013 U	0.0011 U	0.0012 U	6.9	27	0.016 J	0.0025	0.0013 U	0.0023	0.0027	0.0025	0.0012 U
Benzo(k)fluoranthene (mg/kg)	1.5	0.0009 J	0.0011 UJ	0.0016 J	0.0012 U	0.0029	0.0013 U	0.0019	0.0013 U	0.0011 U	0.0012 U	10	7.2	0.016	0.0028	0.0013 U	0.0027	0.0029	0.0024	0.0012 U
Chrysene (mg/kg)	15	0.0011 J	0.0011 U	0.0031 J	0.0012 U	0.0059	0.0013 U	0.0051	0.0013 U	0.0011 U	0.0012 U	20	36	0.037	0.0048	0.0023	0.0043	0.0049	0.0038	0.0012 U
Dibenzo(a,h)anthracene (mg/kg)	0.015	0.0015 J	0.0011 J	0.0023 J	0.0012 U	0.0013 J	0.00094 J	0.00099 J	0.0008 J	0.0011 U	0.0012 U	1.4	13	0.0028	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0013 U	0.0012 U
Indeno(1,2,3-cd)pyrene (mg/kg)	0.15	0.0019	0.0013	0.003 J	0.0012 U	0.0022	0.001 J	0.0016	0.00087 J	0.0011 U	0.0012 U	5.1	28	0.015 J	0.0016	0.0013 U	0.0016	0.0018	0.0016	0.0012 U
Total cPAHs TEQ (ND = 0) (mg/kg)	0.015	0.00154	0.00024	0.00364 J	ND	0.00618	0.00019 J	0.0043	0.00017 J	0.0034	ND	18.6	39.1	0.033	0.00454	0.015	0.014	0.0111	0.0189	ND
Total cPAHs TEQ (ND = 1/2 RDL) (mg/kg)	0.015	0.0017	0.00096	0.0037 J	ND	0.00618	0.00105 J	0.0043	0.00102 J	0.00368	ND	18.6	39.1	0.033	0.0046	0.0153	0.014	0.0112	0.019	ND

Table F-2 - Soil Quality Data
Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	SP01 5/12/08 (3.5-5ft)	SP01 5/12/08 (8.5-10ft)	SP01 5/12/08 (13.5-15ft)	SP01 5/12/08 (18.5-20ft)	SP02 5/12/08 (0-5ft)	SP02 5/12/08 (10-11.5ft)	SP02 5/12/08 (12.5-14ft)	SP02 5/12/08 (18.5-20ft)	SP02 5/12/08 (23.5-25ft)	SP02 5/12/08 (28.5-30ft)	SP03 5/12/08 (4.3-5ft)	SP03 5/12/08 (5-6.5ft)	SP03 5/12/08 (13.5-15ft)	SP03 5/12/08 (18.5-20ft)	SP03 5/12/08 (23.5-25ft)	SP03 5/12/08 (28.5-30ft)	SP03 5/12/08 (33.5-35ft)	SP03 5/12/08 (38.5-40ft)	SP03 5/12/08 (43.5-45ft)
Other (Non-PAH) Semivolatiles																				
1,1'-Biphenyl (mg/kg)	51	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.98	0.065	0.039	0.014 J	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
1,2,4,5-Tetrachlorobenzene (mg/kg)	18	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
1,4-Dioxane (mg/kg)	4.6	0.21 U	0.11 U	0.12 U	0.13 U	0.14 U	0.18 U	0.13 U	0.11 U	0.12 U	0.19 U	12 U	140 U	0.13 U	0.12 U	0.16 U	0.18 U	0.15 U	0.19 U	0.25 U
2,3,4,6-Tetrachlorophenol (mg/kg)	1,800	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
2,4,5-Trichlorophenol (mg/kg)	6,100	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
2,4,6-Trichlorophenol (mg/kg)	44	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
2,4-Dichlorophenol (mg/kg)	180	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
2,4-Dimethylphenol (mg/kg)	1,200	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.031	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
2,4-Dinitrophenol (mg/kg)	120	0.17 UJ	0.12 UJ	0.12 UJ	0.12 UJ	0.13 UJ	0.13 UJ	0.13 U	0.13 U	0.12 U	0.12 U	0.12 U	0.16 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
2-Chloronaphthalene (mg/kg)	6,300	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
2-Chlorophenol (mg/kg)	390	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
2-Methylphenol (mg/kg)	3,100																			
2-Nitroaniline (mg/kg)	610	0.067 U	0.047 U	0.048 U	0.049 U	0.052 U	0.053 U	0.052 U	0.052 U	0.047 U	0.049 U	0.05 U	0.063 U	0.052 U	0.052 U	0.052 U	0.052 U	0.054 U	0.052 U	0.05 U
2-Nitrophenol (mg/kg)	1.6	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
3 & 4 Methylphenol (mg/kg)																				
3,3'-Dichlorobenzidine (mg/kg)	1.1	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
3-Nitroaniline (mg/kg)	3.16	0.067 U	0.047 U	0.048 U	0.049 U	0.052 U	0.053 U	0.052 U	0.052 U	0.047 U	0.049 U	0.05 U	0.063 U	0.052 U	0.052 U	0.052 U	0.052 U	0.054 U	0.052 U	0.05 U
4,6-Dinitro-2-methylphenol (mg/kg)	4.9	0.067 U	0.047 U	0.048 U	0.049 U	0.052 U	0.053 U	0.052 U	0.052 U	0.047 U	0.049 U	0.05 U	0.063 U	0.052 U	0.052 U	0.052 U	0.052 U	0.054 U	0.052 U	0.05 U
4-Bromophenyl phenyl ether (mg/kg)		0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
4-Chloro-3-methylphenol (mg/kg)	6,100	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
4-Chloroaniline (mg/kg)	2.4	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
4-Chlorophenyl phenyl ether (mg/kg)		0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
4-Methylphenol (mg/kg)	6,100	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
4-Nitroaniline (mg/kg)	24	0.067 U	0.047 U	0.048 U	0.049 U	0.052 U	0.053 U	0.052 U	0.052 U	0.047 U	0.049 U	0.05 U	0.063 U	0.052 U	0.052 U	0.052 U	0.052 U	0.054 U	0.052 U	0.05 U
4-Nitrophenol (mg/kg)	5.12	0.067 U	0.047 U	0.048 U	0.049 U	0.052 U	0.053 U	0.052 U	0.052 U	0.047 U	0.049 U	0.05 U	0.063 U	0.052 U	0.052 U	0.052 U	0.052 U	0.054 U	0.052 U	0.05 U
Acetophenone (mg/kg)	7,800	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	1.5	0.03 J	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Aniline (mg/kg)	85																			
Atrazine (mg/kg)	2.1	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Benzaldehyde (mg/kg)	7,800	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Benzidine (mg/kg)	0.0005	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Benzoic acid (mg/kg)	240,000																			
Benzyl alcohol (mg/kg)	6,100																			
Benzyl butyl phthalate (mg/kg)	260	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Bis(2-chloro-1-methylethyl) ether (mg/kg)	4.6	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Bis(2-chloroethoxy)methane (mg/kg)	180	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Bis(2-chloroethyl) ether (mg/kg)	0.21	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Bis(2-ethylhexyl) phthalate (mg/kg)	35	0.16	0.096	0.12	0.18	0.16	0.17	0.24	0.11	0.2	0.24	0.025 U	0.031 U	0.1	0.11	0.14	0.15	0.1	0.12	0.1
Caprolactam (mg/kg)	30,000	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Carbazole (mg/kg)		0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.49	0.12	0.026	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.019 J
Diethyl phthalate (mg/kg)	49,000	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Dimethyl phthalate (mg/kg)	734	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Di-n-butyl phthalate (mg/kg)	6,100	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Di-n-octyl phthalate (mg/kg)	610	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Hexachlorobenzene (mg/kg)	0.3	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Hexachlorocyclopentadiene (mg/kg)	370	0.082 UJ	0.058 UJ	0.06 UJ	0.061 UJ	0.065 UJ	0.066 UJ	0.065 U	0.064 U	0.059 U	0.061 U	0.062 U	0.078 U	0.065 U	0.064 U	0.064 U	0.065 U	0.067 U	0.065 U	0.063 U
Hexachloroethane (mg/kg)	12	0.0042 U	0.0022 U	0.0024 U	0.0026 U	0.0027 U	0.0036 U	0.0026 U	0.0022 U	0.0024 U	0.0038 U	0.025 U	0.031 U	0.0026 U	0.0025 U	0.0032 U	0.0037 U	0.0029 U	0.0038 U	0.0049 U
Isophorone (mg/kg)	510	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Nitrobenzene (mg/kg)	4.8																			
N-Nitrosodimethylamine (mg/kg)	0.0023	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
N-Nitroso-di-n-propylamine (mg/kg)	0.069	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
N-Nitrosodiphenylamine (mg/kg)	99	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.026 U	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
Pentachlorophenol (mg/kg)	0.89	0.0033 U	0.0023 U	0.0024 U	0.0024 U	0.0026 UJ	0.0026 U	0.0026 U	0.0025 U	0.0023 U	0.0024 U	0.025 U	0.031 U	0.0026 U	0.0025 U	0.0025 U	0.0026 U	0.0026 U	0.0026 U	0.0025 U
Phenol (mg/kg)	18,000	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	0.025 U	0.031 U	0.023 J	0.039	0.081	0.026 U	0.062	0.1	0.077
2,4-Dinitrotoluene (mg/kg)	1.6																			
2,6-Dinitrotoluene (mg/kg)	0.0328																			

Table F-2 - Soil Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	SP01 5/12/08 (3.5-5ft)	SP01 5/12/08 (8.5-10ft)	SP01 5/12/08 (13.5-15ft)	SP01 5/12/08 (18.5-20ft)	SP02 5/12/08 (0-5ft)	SP02 5/12/08 (10-11.5ft)	SP02 5/12/08 (12.5-14ft)	SP02 5/12/08 (18.5-20ft)	SP02 5/12/08 (23.5-25ft)	SP02 5/12/08 (28.5-30ft)	SP03 5/12/08 (4.3-5ft)	SP03 5/12/08 (5-6.5ft)	SP03 5/12/08 (13.5-15ft)	SP03 5/12/08 (18.5-20ft)	SP03 5/12/08 (23.5-25ft)	SP03 5/12/08 (28.5-30ft)	SP03 5/12/08 (33.5-35ft)	SP03 5/12/08 (38.5-40ft)	SP03 5/12/08 (43.5-45ft)
Volatile Organic Compounds (VOC)																				
1,1,1,2-Tetrachloroethane (mg/kg)	1.9	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	1.2 U	14 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,1,1-Trichloroethane (mg/kg)	8,700	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,1,2 - Trichlorotrifluoroethane (mg/kg)	43,000	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,1,2,2-Tetrachloroethane (mg/kg)	0.56	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,1,2-Trichloroethane (mg/kg)	1.1	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,1-Dichloroethane (mg/kg)	3.3	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,1-Dichloroethene (mg/kg)	240	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,1-Dichloropropene (mg/kg)																				
1,2,3-Trichlorobenzene (mg/kg)	49	0.00014 J	0.0054 U	0.0061 U	0.0065 U	0.0068 U	0.009 U	0.0064 U	0.00013 J	0.006 U	0.0094 U	0.58 U	7 U	0.0064 U	0.0062 U	0.00017 J	0.00017 J	0.0073 U	0.00017 J	0.012 U
1,2,3-Trichloropropane (mg/kg)	0.005	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	1.2 U	14 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,2,4-Trichlorobenzene (mg/kg)	22	0.00023 J	0.0054 U	0.0061 U	0.0065 U	0.0068 U	0.009 U	0.0064 U	0.0063 U	0.006 U	0.0094 U	0.58 U	7 U	0.0064 U	0.0062 U	0.0079 U	0.0092 U	0.0073 U	0.0094 U	0.012 U
1,2,4-Trimethylbenzene (mg/kg)	62	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	2.5	0.031 U	0.014 J	0.026 U	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
1,2-Dibromo-3-chloropropane (mg/kg)	0.0054	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,2-Dibromoethane (EDB) (mg/kg)	0.034	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,2-Dichlorobenzene (mg/kg)	1,900	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.025 U	0.031 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,2-Dichloroethane (EDC) (mg/kg)	0.43	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,2-Dichloropropane (mg/kg)	0.94	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,3,5-Trimethylbenzene (mg/kg)	780	0.033 U	0.024 U	0.024 U	0.025 U	0.026 U	0.026 U	0.026 U	0.026 U	0.023 U	0.024 U	5.5	0.031 U	0.041	0.026	0.026 U	0.026 U	0.027 U	0.026 U	0.025 U
1,3-Dichlorobenzene (mg/kg)	37.7	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.025 U	0.031 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
1,3-Dichloropropane (mg/kg)	1,600																			
1,4-Dichlorobenzene (mg/kg)	2.4	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.025 U	0.031 U	0.0013 U	0.0012 U	0.0016 U	0.00037 J	0.0015 U	0.0019 U	0.0025 U
1,4-Difluorobenzene (mg/kg)																				
2,2-Dichloropropane (mg/kg)																				
2-Butanone (mg/kg)	28,000	0.011 U	0.0054 U	0.0061 U	0.0065 U	0.0068 U	0.009 U	0.0064 U	0.0056 U	0.006 U	0.0094 U	1.2 U	2.4 J	0.0064 U	0.0062 U	0.015	0.0092 U	0.0073 U	0.0094 U	0.012 U
2-Chlorotoluene (mg/kg)	1,600																			
2-Hexanone (mg/kg)	12.6	0.011 UJ	0.0054 UJ	0.0061 UJ	0.0065 UJ	0.0068 UJ	0.009 UJ	0.0064 U	0.0063 U	0.006 U	0.0094 U	1.2 U	14 U	0.0064 U	0.0062 U	0.0079 U	0.0092 U	0.0073 U	0.0094 U	0.012 U
4-Chlorotoluene (mg/kg)	1,600																			
4-Methyl-2-pentanone (mg/kg)	5,300	0.011 U	0.0054 U	0.0061 U	0.0065 U	0.0068 U	0.009 U	0.0064 U	0.0056 U	0.006 U	0.0094 U	1.2 U	14 U	0.0064 U	0.0062 U	0.0079 U	0.0092 U	0.0073 U	0.0094 U	0.012 U
Acetone (mg/kg)	61,000	0.055	0.031	0.04	0.0065 U	0.036	0.025	0.0094	0.027	0.05	0.028	1.2 U	14 U	0.047	0.024	0.064	0.047	0.033	0.056	0.012 U
Benzene (mg/kg)	1.1	0.0022	0.002	0.0012 J	0.00085 J	0.0014 U	0.0014 J	0.0012 J	0.00088 J	0.00069 J	0.0019 U	4.7	12	0.0016	0.0064	0.23	0.044	0.38	0.17	0.01
Bromobenzene (mg/kg)	300																			
Bromochloromethane (mg/kg)	160	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Bromodichloromethane (mg/kg)	0.27	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Bromoform (mg/kg)	15.9	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Bromomethane (mg/kg)	7.3	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Carbon disulfide (mg/kg)	820	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0059	0.0043	0.0075	0.0056	0.0025 U
Carbon tetrachloride (mg/kg)	0.61	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Chlorobenzene (mg/kg)	290	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Chlorobenzene-d5 (mg/kg)																				
Chloroethane (mg/kg)	15,000	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Chloroform (mg/kg)	0.29	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.00048 J	0.0015 U	0.00056 J	0.044
Chloromethane (mg/kg)	120	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
cis-1,2-Dichloroethene (DCE) (mg/kg)	160	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
cis-1,3-Dichloropropene (mg/kg)	0.398	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	0.93 J	0.0013 U	0.0012 U	0.0016 U	0.00063 J	0.0015 U	0.00064 J	0.0025 U
Cyclohexane (mg/kg)	7,000	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Dibromochloromethane (mg/kg)	0.68	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Dibromomethane (mg/kg)	25																			
Dichlorodifluoromethane (mg/kg)	94	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Ethylbenzene (mg/kg)	5.4	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	3.6	24	0.01	0.0061	0.0016 U	0.00073 J	0.0015 U	0.0011 J	0.0018 J
Hexachlorobutadiene (mg/kg)	6.2	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.025 U	0.031 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Isopropylbenzene (mg/kg)	2,100	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.13	1.6	0.00094 J	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Methyl acetate (mg/kg)	78,000	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	0.16 J	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Methyl tert-butyl ether (MTBE) (mg/kg)	43	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
Methylcyclohexane (mg/kg)		0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.00037 J	0.0015 U	0.00039 J	0.0025 U
Methylene chloride (mg/kg)	56	0.0021 U	0.0011 U	0.0013 U	0.001 J	0.0014 U	0.0018 U	0.0011 J	0.00086 J	0.00096 J	0.0014 J	0.22	1.3 J	0.00082 J	0.002	0.0036	0.0023	0.00099 J	0.0024	0.0061
n-Butylbenzene (mg/kg)	3,900																			
n-Hexane (mg/kg)	570																			

Table F-2 - Soil Quality Data

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Soil Initial PRG	SP01 5/12/08 (3.5-5ft)	SP01 5/12/08 (8.5-10ft)	SP01 5/12/08 (13.5-15ft)	SP01 5/12/08 (18.5-20ft)	SP02 5/12/08 (0-5ft)	SP02 5/12/08 (10-11.5ft)	SP02 5/12/08 (12.5-14ft)	SP02 5/12/08 (18.5-20ft)	SP02 5/12/08 (23.5-25ft)	SP02 5/12/08 (28.5-30ft)	SP03 5/12/08 (4.3-5ft)	SP03 5/12/08 (5-6.5ft)	SP03 5/12/08 (13.5-15ft)	SP03 5/12/08 (18.5-20ft)	SP03 5/12/08 (23.5-25ft)	SP03 5/12/08 (28.5-30ft)	SP03 5/12/08 (33.5-35ft)	SP03 5/12/08 (38.5-40ft)	SP03 5/12/08 (43.5-45ft)
n-Propylbenzene (mg/kg)	3,400																			
Pentafluorobenzene (mg/kg)																				
p-Isopropyltoluene (mg/kg)																				
sec-Butylbenzene (mg/kg)	7,800																			
Styrene (mg/kg)	6,300	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.07 J	7 U	0.0015	0.003	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
tert-Butylbenzene (mg/kg)	7,800																			
Tetrachloroethene (PCE) (mg/kg)	22	0.00059 J	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.00045 J	0.0015 U	0.00044 J	0.0025 U
Toluene (mg/kg)	5,000	0.00084 J	0.00057 J	0.00063 J	0.0012 J	0.0016	0.0018 U	0.001 J	0.0006 J	0.0012 U	0.0019 U	7.5	3.3	0.00098 J	0.001 J	0.0021	0.0021	0.0012 J	0.0029	0.0025 U
trans-1,2-Dichloroethene (mg/kg)	150	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
trans-1,3-Dichloropropene (mg/kg)	0.398	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	0.93 J	0.0013 U	0.0012 U	0.0016 U	0.00063 J	0.0015 U	0.00064 J	0.0025 U
Trichloroethene (TCE) (mg/kg)	0.91	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.00044 J	0.0015 U	0.00044 J	0.0025 U
Trichlorofluoromethane (mg/kg)	790	0.0019 J	0.0006 J	0.00094 J	0.0018	0.0032	0.0013 J	0.0015	0.00088 J	0.00084 J	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0019	0.0024	0.0078	0.0045	0.0025 U
Vinyl chloride (mg/kg)	0.06	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	0.58 U	7 U	0.0013 U	0.0012 U	0.0016 U	0.0018 U	0.0015 U	0.0019 U	0.0025 U
m,p-Xylenes (mg/kg)	630	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	5.7	57	0.014	0.008	0.0016 U	0.00052 J	0.0023	0.00066 J	0.0025 U
o-Xylene (mg/kg)	690	0.0021 U	0.0011 U	0.0012 U	0.0013 U	0.0014 U	0.0018 U	0.0013 U	0.0011 U	0.0012 U	0.0019 U	3.4	55	0.014	0.0065	0.0016 U	0.00049 J	0.0015 U	0.0009 J	0.0025 U
Xylenes (total) (mg/kg)	630																			
Polychlorinated Biphenyls (PCBs)																				
Aroclor 1016 (mg/kg)	3.9																			
Aroclor 1221 (mg/kg)	0.14																			
Aroclor 1232 (mg/kg)	0.14																			
Aroclor 1242 (mg/kg)	0.22																			
Aroclor 1248 (mg/kg)	0.22																			
Aroclor 1254 (mg/kg)	0.22																			
Aroclor 1260 (mg/kg)	0.22																			
Aroclor 1262 (mg/kg)																				
Aroclor 1268 (mg/kg)																				

Notes

Concentrations in shaded cells indicate value exceeds Soil PRG.

Where a sample has multiple results for a given analyte (tested for in multiple methods) the highest detected value is shown. Where all results were non-detects, the result with the lowest detection limit is shown.

J = Analyte was positively identified. The reported result is an estimate.

JQ = Approximate value due to quality control problems.

PRG = preliminary remediation goal

QP = Hydrocarbon result partly due to individual peak(s) in quantitation range.

U = Analyte was not detected at or above the reported result.

UJ = Analyte was not detected at or above the reported estimate

Table F-3A - Sediment Quality Data - 2013 Removal Evaluation

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	BGW-RE-GP-02 9/3/13 (0-1.4 ft)	BGW-RE-GP-02 FD 9/3/13 (0-1.4 ft)	BGW-RE-GP-02 9/3/13 (1-1.3 ft)	BGW-RE-GP-02 9/3/13 (1.4-4 ft)	BGW-RE-GP-03 9/3/13 (0-2.3 ft)	BGW-RE-GP-03 9/3/13 (0.8-1.4 ft)	BGW-RE-GP-03 9/3/13 (2.3-3.2 ft)	BGW-RE-GP-03 9/3/13 (2.3-4 ft)	BGW-RE-GP-03 FD 9/3/13 (2.3-4 ft)	BGW-RE-GP-03 9/3/13 (4-5 ft)	BGW-RE-GP-04 9/3/13 (0-2.2 ft)	BGW-RE-GP-04 9/3/13 (2.2-4 ft)	BGW-RE-GP-05 9/3/13 (0-1.5 ft)	BGW-RE-GP-05 9/3/13 (0.4-1.2 ft)	BGW-RE-GP-05 9/3/13 (1.5-4 ft)	BGW-RE-GP-05 9/3/13 (4-5 ft)	BGW-RE-GP-06 9/3/13 (0.8-2.3 ft)	BGW-RE-GP-06 9/3/13 (2.3-4 ft)
Conventional Chemistry Parameters																			
Total Organic Carbon in Percent		3.69	7.08		0.091	1.92			3.87	6.89	0.051	0.066	0.116	5.3		0.176	0.15	11.9	0.151
Total Solids in Percent		83.53	84.25		83.16	81.49			84.55	84.37	83.87	84.87	94.35	77.73		89.63	88.96	82.7	90.96
Polycyclic Aromatic Hydrocarbons (PAHs)																			
Acenaphthene in ug/kg	500	13,000	9,300		1.5	19,000			76,000	79,000	19	3.6	2.7	130,000		110	82	12,000	1.2
Acenaphthylene in ug/kg	1,300	160,000	120,000		65	87,000			840,000	730,000	100	24 J	32	8,600		21	31	32,000	7.4
Anthracene in ug/kg	960	180,000	140,000		64	160,000			680,000	430,000	150	20 J	2.8	110,000		45	88	24,000	1.3
Benzo(g,h,i)perylene in ug/kg	670	150,000	88,000		110	35,000			150,000	150,000	36	48	73	93,000		41	78	49,000	2.5
Dibenzofuran in ug/kg	540	16,000	11,000		4.6	11,000			69,000	68,000	19	21 J	1.6	6,100		13	15	3,200	1.4
Fluoranthene in ug/kg	1,700	410,000	340,000		240	140,000			770,000	680,000	230	130	29	350,000		220	350	140,000	15
Fluorene in ug/kg	540	150,000	88,000		28	110,000			600,000	510,000	72	7.9 J	5.5	12,000		44	36	14,000	2.1
Phenanthrene in ug/kg	1,500	580,000	380,000		290	280,000			1,700,000	1,500,000	720	320	16	390,000		130	240	130,000	12
Pyrene in ug/kg	2,600	680,000	550,000		370	210,000			1,200,000	1,100,000	360	180	40	440,000		320	500	160,000	17
Naphthalene in ug/kg	2,100	49,000	33,000	400,000	32	15,000	1,800	120,000	1,700,000	1,500,000	58	220	41	27,000	46	63	64	20,000	22
Benz(a)anthracene in ug/kg	1,300	210,000	170,000		95	54,000			280,000	250,000	51	57	16	110,000		30	72	40,000	1.4
Benzo(a)pyrene in ug/kg	1,600	220,000	160,000		140	54,000			280,000	240,000	52	56	60	130,000		34	76	55,000	1.6
Benzo(b)fluoranthene in ug/kg	10,400	86,000	66,000		73	25,000			110,000	110,000	23	42 J	34	65,000		20	45	25,000	1.2
Benzo(k)fluoranthene in ug/kg	240	46,000	39,000		34	14,000			59,000	64,000	15	19 J	12	30,000		7.5	26	14,000	0.5
Chrysene in ug/kg	1,400	200,000	150,000		91	48,000			260,000	220,000	51	73	18	110,000		32	120	45,000	2
Dibenzo(a,h)anthracene in ug/kg	230	22,000 J	16,000 J		20 J	7,500 J			30,000 J	27,000 J	6.5 J	11 J	12 J	10,000 J		4.3 J	11 J	5,700 J	0.3 J
Indeno(1,2,3-cd)pyrene in ug/kg	600	72,000	53,000		72	21,000			91,000	89,000	26	43 J	48	47,000		27	51	24,000	1.5
Total cPAHs TEQ (ND = 0) in ug/kg	1,600	279,460 J	205,440 J		184.431 J	71,688 J			358,950 J	312,760 J	68.7 J	81.463 J	81.938 J	162,610 J		46.1 J	104.18 J	69,785 J	2.3 J
Total cPAHs TEQ (ND = 1/2 RDL) in ug/kg	1,600	279,460 J	205,440 J		184.431 J	71,688 J			358,950 J	312,760 J	68.7 J	81.463 J	81.938 J	162,610 J		46.1 J	104.18 J	69,785 J	2.3 J
Total HPAHs in ug/kg	12,000	2,145,000 J	1,669,000 J		1,283 J	621,500 J			3,294,000 J	2,993,000 J	864.5 J	681 J	355 J	1,415,000 J		743.5 J	1,352 J	571,700 J	43.5 J
Total LPAHs in ug/kg	5,200	1,132,000	770,300		480.5	671,000			5,596,000	4,749,000	1,119	595.5 J	100	677,600		413	541	232,000	46
Total PAHs in ug/kg	4,022	3,277,000 J	2,439,300 J		1,764 J	1,292,500 J			8,890,000 J	7,742,000 J	1,984 J	1,277 J	455 J	2,092,600 J		1,157 J	1,893 J	803,700 J	89.5 J
Other (Non-PAH) Semivolatiles																			
1,2,4-Trichlorobenzene in ug/kg	31			16,000 U			390 U	6,700 U							6.1 U				
1,2-Dichlorobenzene in ug/kg	35			3,300 U			78 U	1,300 U							1.2 U				
1,3-Dichlorobenzene in ug/kg	842			33 U			78 U	13 U							1.2 U				
1,4-Dichlorobenzene in ug/kg	110			3,300 U			78 U	1,300 U							1.2 U				
Hexachlorobutadiene in ug/kg	11			16,000 U			390 U	6,700 U							6.1 U				
Volatile Organic Compounds (VOC)																			
1,1,1,2-Tetrachloroethane in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
1,1,1-Trichloroethane in ug/kg	856			3,300 U			78 U	1,300 U							1.2 U				
1,1,2 - Trichlorotrifluoroethane in ug/kg				6,600 U			160 U	2,700 U							2.4 U				
1,1,2,2-Tetrachloroethane in ug/kg	202			3,300 U			78 U	1,300 U							1.2 U				
1,1,2-Trichloroethane in ug/kg	570			3,300 U			78 U	1,300 U							1.2 U				
1,1-Dichloroethane in ug/kg	0.575			3,300 U			78 U	1,300 U							1.2 U				
1,1-Dichloroethene in ug/kg	2,780			3,300 U			78 U	1,300 U							1.2 U				
1,1-Dichloropropene in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
1,2,3-Trichlorobenzene in ug/kg	858			16,000 U			390 U	6,700 U							6.1 U				
1,2,3-Trichloropropane in ug/kg				6,600 U			160 U	2,700 U							2.4 U				
1,2,4-Trimethylbenzene in ug/kg				3,300 U			78 U	980 J							2.4				
1,2-Dibromo-3-chloropropane in ug/kg				16,000 U			390 U	6,700 U							6.1 U				
1,2-Dibromoethane (EDB) in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
1,2-Dichloroethane (EDC) in ug/kg	260			3,300 U			78 U	1,300 U							1.2 U				
1,2-Dichloropropane in ug/kg	333			3,300 U			78 U	1,300 U							1.2 U				
1,3,5-Trimethylbenzene in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
1,3-Dichloropropane in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
1,4-Dichloro-2-Butene in ug/kg				16,000 U			390 U	6,700 U							6.1 U				
2,2-Dichloropropane in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
2-Butanone in ug/kg	42.4			16,000 U			390 U	6,700 U							6.1 U				
2-Chloroethyl Vinyl Ether in ug/kg				16,000 UJ			390 UJ	6,700 UJ							6.1 UJ				

Table F-3A - Sediment Quality Data - 2013 Removal Evaluation

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	BGW-RE-GP-02 9/3/13 (0-1.4 ft)	BGW-RE-GP-02 FD 9/3/13 (0-1.4 ft)	BGW-RE-GP-02 9/3/13 (1-1.3 ft)	BGW-RE-GP-02 9/3/13 (1.4-4 ft)	BGW-RE-GP-03 9/3/13 (0-2.3 ft)	BGW-RE-GP-03 9/3/13 (0.8-1.4 ft)	BGW-RE-GP-03 9/3/13 (2.3-3.2 ft)	BGW-RE-GP-03 9/3/13 (2.3-4 ft)	BGW-RE-GP-03 FD 9/3/13 (2.3-4 ft)	BGW-RE-GP-03 9/3/13 (4-5 ft)	BGW-RE-GP-04 9/3/13 (0-2.2 ft)	BGW-RE-GP-04 9/3/13 (2.2-4 ft)	BGW-RE-GP-05 9/3/13 (0-1.5 ft)	BGW-RE-GP-05 9/3/13 (0.4-1.2 ft)	BGW-RE-GP-05 9/3/13 (1.5-4 ft)	BGW-RE-GP-05 9/3/13 (4-5 ft)	BGW-RE-GP-06 9/3/13 (0.8-2.3 ft)	BGW-RE-GP-06 9/3/13 (2.3-4 ft)
2-Chlorotoluene in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
2-Hexanone in ug/kg	58.2			16,000 U			390 U	6,700 U							6.1 U				
4-Chlorotoluene in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
4-Methyl-2-pentanone in ug/kg	25.1			16,000 U			390 U	6,700 U							6.1 U				
Acetone in ug/kg	9.9			16,000 U			390 U	6,700 U							6.1 U				
Acrolein in ug/kg	0.00152			160,000 U			3,900 U	67,000 U							61 U				
Acrylonitrile in ug/kg	1.2			16,000 U			390 U	6,700 U							6.1 U				
Benzene in ug/kg	137			3,300 U			78 U	1,300 U							8.1				
Bromobenzene in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Bromochloromethane in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Bromodichloromethane in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Bromoethane in ug/kg				6,600 U			160 U	2,700 U							2.4 U				
Bromoform in ug/kg	1,310			3,300 U			78 U	1,300 U							1.2 U				
Bromomethane in ug/kg	1.37			6,600 U			160 U	2,700 U							1.2 U				
Carbon disulfide in ug/kg	0.851			3,300 U			78 U	1,300 U							4.3				
Carbon tetrachloride in ug/kg	7,240			3,300 U			78 U	1,300 U							1.2 U				
Chlorobenzene in ug/kg	162			3,300 U			78 U	1,300 U							1.2 U				
Chloroethane in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Chloroform in ug/kg	121			3,300 U			78 U	1,300 U							1.2 U				
Chloromethane in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
cis-1,2-Dichloroethene (DCE) in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
cis-1,3-Dichloropropene in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Dibromochloromethane in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Dibromomethane in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Ethylbenzene in ug/kg	305			3,300 U			78 U	1,300 U							24				
Isopropylbenzene in ug/kg	86			3,300 U			78 U	1,300 U							9				
Methylene chloride in ug/kg	159			18,000 U			160 U	6,800 U							4.9 U				
Methyliodide in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
n-Butylbenzene in ug/kg				3,300 U			84	1,300 U							1.2 U				
n-Propylbenzene in ug/kg				3,300 U			78 U	1,300 U							8.3				
p-Isopropyltoluene in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
sec-Butylbenzene in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Styrene in ug/kg	7,070			3,300 U			78 U	1,300 U							1.2 U				
tert-Butylbenzene in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Tetrachloroethene (PCE) in ug/kg	190			3,300 U			78 U	1,300 U							1.2 U				
Toluene in ug/kg	1,090			3,300 U			78 U	1,300 U							1.5				
trans-1,2-Dichloroethene in ug/kg	1,050			3,300 U			78 U	1,300 U							1.2 U				
trans-1,3-Dichloropropene in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Trichloroethene (TCE) in ug/kg	8,950			3,300 U			78 U	1,300 U							1.2 U				
Trichlorofluoromethane in ug/kg				3,300 U			78 U	1,300 U							1.2 U				
Vinyl acetate in ug/kg	13			16,000 U			390 U	6,700 U							6.1 U				
Vinyl chloride in ug/kg	202			3,300 U			78 U	1,300 U							1.2 U				
m,p-Xylenes in ug/kg				6,600 U			160 U	2,700 U							1.7				
o-Xylene in ug/kg				3,300 U			78 U	1,300 U							3.9				

Table F-3A - Sediment Quality Data - 2013 Removal Evaluation

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	BGW-RE-GP-07 9/3/13 (0-2.1 ft)	BGW-RE-GP-07 9/3/13 (2.1-5 ft)	BGW-RE-GP-08 9/3/13 (0-2.7 ft)	BGW-RE-GP-08 9/3/13 (2.7-5 ft)	BGW-RE-SG-01 7/8/13 (0-4 in)	BGW-RE-SG-02 7/8/13 (0-4 in)	BGW-RE-SG-03 7/8/13 (0-4 in)	BGW-RE-SG-04 7/8/13 (0-4 in)	BGW-RE-SG-04 7/8/13 (4-12 in)	BGW-RE-SG-05 7/8/13 (0-4 in)	BGW-RE-SG-06 7/8/13 (0-4 in)	BGW-RE-SG-07 7/8/13 (0-4 in)	BGW-RE-SG-08 7/8/13 (0-4 in)	BGW-RE-SG-08 FD 7/8/13 (0-4 in)	BGW-RE-SG-09 7/8/13 (0-4 in)	BGW-RE-SG-10 7/8/13 (0-4 in)	BGW-RE-SG-11 7/8/13 (0-4 in)	BGW-RE-SG-12 7/8/13 (0-4 in)
Conventional Chemistry Parameters																			
Total Organic Carbon in Percent		0.635	0.127	0.521	0.127	6.79 J	1.61 J	3.52 J	5.15 J	2.45	12.6 J	3.66 J	4.69 J	9.31 J	4.98	3.83 J	2.89 J	3.28 J	2.34 J
Total Solids in Percent		88.92	84.08	83.26	92.41	80.14	80.02	80.46	77.2	75.6	70.92	79.4	81.32	78.02	81.48	74.83	78.34	77.27	77.52
Polycyclic Aromatic Hydrocarbons (PAHs)																			
Acenaphthene in ug/kg	500	73	0.4 J	4.4	0.5 U	220	330	220	17,000	21,000	160,000	340	59	150	280	100	94	260	120
Acenaphthylene in ug/kg	1,300	97	0.7	26	0.8	2,000	2,600	1,300	14,000	27,000	42,000	1,700	1,200	4,500	7,000	2,000	1,200	2,700	890
Anthracene in ug/kg	960	81	0.3 J	24	0.3 J	1,800	2,600	1,300	35,000	61,000	180,000	1,600	1,000	3,500	5,200	1,400	1,900	3,000	890
Benzo(g,h,i)perylene in ug/kg	670	760	0.9	190	1.4	13,000	10,000	11,000	14,000	25,000	260,000	9,000	5,600	21,000	16,000	8,100	8,000	10,000	3,600
Dibenzofuran in ug/kg	540	25	0.3 J	9.6	0.3 J	280	310	220	3,000	6,200	13,000	280	220	520	1,100	260	250	360	180
Fluoranthene in ug/kg	1,700	1,400	1.6	320	2.3	24,000	24,000	22,000	61,000	100,000	1,100,000	18,000	9,900	36,000	32,000	13,000	14,000	20,000	8,200
Fluorene in ug/kg	540	48	0.3 J	5.8	0.5 U	1,000	1,200	580	33,000	61,000	42,000	970	540	1,100	2,000	780	680	1,400	520
Phenanthrene in ug/kg	1,500	370	3	170	2.6	11,000	10,000	7,600	120,000	230,000	490,000	9,100	7,000	17,000	27,000	7,800	7,900	16,000	4,300
Pyrene in ug/kg	2,600	1,600	1.6	280	2.5	36,000	31,000	32,000	95,000	140,000	1,400,000	24,000	15,000	47,000	34,000	20,000	22,000	28,000	13,000
Naphthalene in ug/kg	2,100	250	5.4	87	14	1,500	1,200	980	10,000	9,000	52,000	1,200	1,100	3,800	16,000	1,300	1,200	2,500	1,200
Benz(a)anthracene in ug/kg	1,300	580	0.3 J	100	1.1	12,000	12,000	11,000	22,000	37,000	310,000	9,100	5,100	23,000	17,000	8,400	7,500	9,400	4,000
Benzo(a)pyrene in ug/kg	1,600	730	0.5 J	150	1.2	13,000	13,000	14,000	22,000	35,000	400,000	10,000	5,500	26,000	16,000	9,400	9,300	11,000	4,300
Benzo(b)fluoranthene in ug/kg	10,400	430	0.4 J	120	0.9	9,600	8,400	8,600	12,000	18,000	200,000	7,000	4,300	18,000	12,000	6,600	5,900	7,400	2,800
Benzo(k)fluoranthene in ug/kg	240	200	0.5 U	46	0.5	4,600	4,100	4,000	6,500	11,000	93,000	3,300	2,200	7,800	6,100	3,300	2,900	3,500	1,500
Chrysene in ug/kg	1,400	600	0.5 J	150	1.4	13,000	11,000	11,000	24,000	45,000	270,000	9,200	5,500	25,000	22,000	8,700	7,900	11,000	4,200
Dibenzo(a,h)anthracene in ug/kg	230	88 J	0.5 U	26 J	0.2 J	1,500	1,200	1,200	1,900	4,000	38,000	1,000	660	3,200	2,800	900	700	750	330
Indeno(1,2,3-cd)pyrene in ug/kg	600	510	0.4 J	120	1	8,800	7,300	8,000	9,500	17,000	190,000	6,300	3,900	14,000	11,000	5,500	5,300	7,100	1,200
Total cPAHs TEQ (ND = 0) in ug/kg	1,600	972.6 J	0.6 J	210.61 J	1.7 J	17,599	17,022	18,011	28,339	46,355	509,200	13,282	7,518	34,803	22,883	12,392	11,907	14,186	5,449
Total cPAHs TEQ (ND = 1/2 RDL) in ug/kg	1,600	972.6 J	0.9 J	210.61 J	1.7 J	17,599	17,022	18,011	28,339	46,355	509,200	13,282	7,518	34,803	22,883	12,392	11,907	14,186	5,449
Total HPAHs in ug/kg	12,000	7,148 J	6.2 J	1,555 J	13 J	140,400	126,600	127,200	274,100	442,000	4,361,000	100,300	59,760	229,700	175,000	87,400	86,500	112,050	44,530
Total LPAHs in ug/kg	5,200	919	10.1 J	317.2	17.7 J	17,520	17,930	11,980	229,000	409,000	966,000	14,910	10,899	30,050	57,480	13,380	12,974	25,860	7,920
Total PAHs in ug/kg	4,022	8,067 J	16.3 J	1,872 J	30.7 J	157,920	144,530	139,180	503,100	851,000	5,327,000	115,210	70,659	259,750	232,480	100,780	99,474	137,910	52,450
Other (Non-PAH) Semivolatiles																			
1,2,4-Trichlorobenzene in ug/kg	31																		
1,2-Dichlorobenzene in ug/kg	35																		
1,3-Dichlorobenzene in ug/kg	842																		
1,4-Dichlorobenzene in ug/kg	110																		
Hexachlorobutadiene in ug/kg	11																		
Volatile Organic Compounds (VOC)																			
1,1,1,2-Tetrachloroethane in ug/kg																			
1,1,1-Trichloroethane in ug/kg	856																		
1,1,2 - Trichlorotrifluoroethane in ug/kg																			
1,1,2,2-Tetrachloroethane in ug/kg	202																		
1,1,2-Trichloroethane in ug/kg	570																		
1,1-Dichloroethane in ug/kg	0.575																		
1,1-Dichloroethene in ug/kg	2,780																		
1,1-Dichloropropene in ug/kg																			
1,2,3-Trichlorobenzene in ug/kg	858																		
1,2,3-Trichloropropane in ug/kg																			
1,2,4-Trimethylbenzene in ug/kg																			
1,2-Dibromo-3-chloropropane in ug/kg																			
1,2-Dibromoethane (EDB) in ug/kg																			
1,2-Dichloroethane (EDC) in ug/kg	260																		
1,2-Dichloropropane in ug/kg	333																		
1,3,5-Trimethylbenzene in ug/kg																			
1,3-Dichloropropane in ug/kg																			
1,4-Dichloro-2-Butene in ug/kg																			
2,2-Dichloropropane in ug/kg																			
2-Butanone in ug/kg	42.4																		
2-Chloroethyl Vinyl Ether in ug/kg																			

Table F-3A - Sediment Quality Data - 2013 Removal Evaluation

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	BGW-RE-GP-07 9/3/13 (0-2.1 ft)	BGW-RE-GP-07 9/3/13 (2.1-5 ft)	BGW-RE-GP-08 9/3/13 (0-2.7 ft)	BGW-RE-GP-08 9/3/13 (2.7-5 ft)	BGW-RE-SG-01 7/8/13 (0-4 in)	BGW-RE-SG-02 7/8/13 (0-4 in)	BGW-RE-SG-03 7/8/13 (0-4 in)	BGW-RE-SG-04 7/8/13 (0-4 in)	BGW-RE-SG-04 7/8/13 (4-12 in)	BGW-RE-SG-05 7/8/13 (0-4 in)	BGW-RE-SG-06 7/8/13 (0-4 in)	BGW-RE-SG-07 7/8/13 (0-4 in)	BGW-RE-SG-08 7/8/13 (0-4 in)	BGW-RE-SG-08 FD 7/8/13 (0-4 in)	BGW-RE-SG-09 7/8/13 (0-4 in)	BGW-RE-SG-10 7/8/13 (0-4 in)	BGW-RE-SG-11 7/8/13 (0-4 in)	BGW-RE-SG-12 7/8/13 (0-4 in)
2-Chlorotoluene in ug/kg																			
2-Hexanone in ug/kg	58.2																		
4-Chlorotoluene in ug/kg																			
4-Methyl-2-pentanone in ug/kg	25.1																		
Acetone in ug/kg	9.9																		
Acrolein in ug/kg	0.00152																		
Acrylonitrile in ug/kg	1.2																		
Benzene in ug/kg	137																		
Bromobenzene in ug/kg																			
Bromochloromethane in ug/kg																			
Bromodichloromethane in ug/kg																			
Bromoethane in ug/kg																			
Bromoform in ug/kg	1,310																		
Bromomethane in ug/kg	1.37																		
Carbon disulfide in ug/kg	0.851																		
Carbon tetrachloride in ug/kg	7,240																		
Chlorobenzene in ug/kg	162																		
Chloroethane in ug/kg																			
Chloroform in ug/kg	121																		
Chloromethane in ug/kg																			
cis-1,2-Dichloroethene (DCE) in ug/kg																			
cis-1,3-Dichloropropene in ug/kg																			
Dibromochloromethane in ug/kg																			
Dibromomethane in ug/kg																			
Ethylbenzene in ug/kg	305																		
Isopropylbenzene in ug/kg	86																		
Methylene chloride in ug/kg	159																		
Methyliodide in ug/kg																			
n-Butylbenzene in ug/kg																			
n-Propylbenzene in ug/kg																			
p-Isopropyltoluene in ug/kg																			
sec-Butylbenzene in ug/kg																			
Styrene in ug/kg	7,070																		
tert-Butylbenzene in ug/kg																			
Tetrachloroethene (PCE) in ug/kg	190																		
Toluene in ug/kg	1,090																		
trans-1,2-Dichloroethene in ug/kg	1,050																		
trans-1,3-Dichloropropene in ug/kg																			
Trichloroethene (TCE) in ug/kg	8,950																		
Trichlorofluoromethane in ug/kg																			
Vinyl acetate in ug/kg	13																		
Vinyl chloride in ug/kg	202																		
m,p-Xylenes in ug/kg																			
o-Xylene in ug/kg																			

Table F-3A - Sediment Quality Data - 2013 Removal Evaluation

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	BGW-RE-SG-13 7/8/13 (0-4 in)	BGW-RE-SG-14 7/8/13 (0-4 in)	BGW-RE-SG-15 7/8/13 (0-4 in)	BGW-RE-SG-15 FD 7/8/13 (0-4 in)	BGW-RE-SG-15 7/8/13 (4-10 in)	BGW-RE-SG-16 7/8/13 (0-4 in)	BGW-RE-SG-17 7/8/13 (0-4 in)	BGW-RE-SG-17 7/8/13 (4-9 in)	BGW-RE-SG-18 7/8/13 (0-4 in)	BGW-RE-SG-19 7/8/13 (0-4 in)	BGW-RE-SG-19 7/8/13 (4-8 in)	BGW-RE-SG-20 7/8/13 (0-4 in)	BGW-RE-SG-21 7/8/13 (0-4 in)	BGW-RE-SG-22 7/8/13 (0-4 in)	BGW-RE-SG-22 7/8/13 (4-10 in)	BGW-RE-SG-23 7/8/13 (0-4 in)	BGW-RE-SG-24 7/8/13 (0-4 in)	BGW-RE-SG-25 7/8/13 (0-4 in)
Conventional Chemistry Parameters																			
Total Organic Carbon in Percent		5.18 J	1.59 J	5.54 J	3.93	1.36	1.75	3.14	1.97	0.514	2.29	1.14	2.92	0.444	2	1.13	2.66	0.207	16.9
Total Solids in Percent		76.12	83.35	69.85	69.56	70.88	75.82	87.5	84.59	89.99	69.43	85.36	64.21	91.67	80.23	79.32	79.19	88.68	79.23
Polycyclic Aromatic Hydrocarbons (PAHs)																			
Acenaphthene in ug/kg	500	190	36	960 J	540	490	150	140	280	72	120	340	960	5.5	44	170 J	270	4.7 U	29
Acenaphthylene in ug/kg	1,300	1,600	460 J	6,400	3,000	4,600	3,200	2,000	3,200	200	920	2,200	7,600	32	440	1,200 J	2,200	12	350 J
Anthracene in ug/kg	960	1,700	440	7,400	4,300	6,700	2,800	1,300	2,700	180	890	2,300	8,100	24 J	440	1,300 J	2,400	8.6	310 J
Benzo(g,h,i)perylene in ug/kg	670	5,500	2,000	20,000	12,000	12,000	8,400	3,500	10,000	570	2,600	6,400	39,000	98	1,700	3,800 J	6,500	72	1,700
Dibenzofuran in ug/kg	540	390	80	1,200	840	580	360	230	370	110	95	260	670	3.8 J	65	120	270	4.7 U	45
Fluoranthene in ug/kg	1,700	14,000	3,900	45,000	29,000	29,000	16,000	13,000	23,000	970	5,700	18,000	87,000	230	3,700	13,000	16,000	130	3,300
Fluorene in ug/kg	540	1,200	210 J	3,500	1,400	1,700	1,000	1,000	1,600	93	470	930	1,900	22	200	540 J	1,600	3.5 J	100 J
Phenanthrene in ug/kg	1,500	8,600	1,600	29,000	14,000	13,000	11,000	12,000	12,000	860	3,200	7,100	27,000	170	1,900	4,400 J	15,000	54	1,200
Pyrene in ug/kg	2,600	20,000	5,700	64,000	36,000	36,000	23,000	18,000	31,000	1,600	8,300	24,000	120,000	350	4,900	18,000	24,000	180	4,400
Naphthalene in ug/kg	2,100	2,200	650	7,100	4,400	3,100	6,400	1,200	3,000	890	580	1,700	4,400	8.6	410	880 J	1,400	11	340 J
Benz(a)anthracene in ug/kg	1,300	6,800	2,600	23,000	13,000	15,000	10,000	5,000	10,000	480	2,700	8,600	47,000	100	1,700	5,600 J	7,300	60	1,500
Benzo(a)pyrene in ug/kg	1,600	7,000	2,700	24,000	14,000	16,000	10,000	4,200	12,000	620	3,000	8,500	50,000	130	2,000	4,400 J	7,800	80	1,800
Benzo(b)fluoranthene in ug/kg	10,400	4,600	1,700	16,000	9,500	8,900	6,300	2,900	7,600	340	1,800	5,100	29,000	74	1,200	2,900 J	5,200	48	1,100
Benzo(k)fluoranthene in ug/kg	240	2,300	760	8,700	4,700	5,300	3,400	1,600	3,800	180	1,000	3,000	18,000	40 J	650	1,700 J	2,800	25	650
Chrysene in ug/kg	1,400	7,000	2,800	24,000	16,000	17,000	11,000	5,100	12,000	530	3,200	9,000	48,000	130	2,100	5,600 J	9,400	74	1,800
Dibenzo(a,h)anthracene in ug/kg	230	940	180	3,600	1,900	2,300	1,400	670	1,800	99	490	1,200	5,900	18	250	670 J	1,100	12	240
Indeno(1,2,3-cd)pyrene in ug/kg	600	3,900	1,400	14,000	7,900	8,600	5,900	2,400	7,500	390	1,700	4,500	27,000	70	1,100	2,600 J	4,200	50	1,100
Total cPAHs TEQ (ND = 0) in ug/kg	1,600	9,500	3,460	33,011	19,003	21,620	13,665	5,921	16,360	842.33	4,123	11,559	66,428	172.93 J	2,659	6,203 J	10,607	108.124	2,418
Total cPAHs TEQ (ND = 1/2 RDL) in ug/kg	1,600	9,500	3,460	33,011	19,003	21,620	13,665	5,921	16,360	842.33	4,123	11,559	66,428	172.93 J	2,659	6,203 J	10,607	108.124	2,418
Total HPAHs in ug/kg	12,000	74,540	24,500	250,600	149,000	155,300	99,200	58,070	123,000	5,979	31,590	91,200	486,900	1,286 J	19,980	59,970 J	87,200	759	18,210
Total LPAHs in ug/kg	5,200	15,490	3,396 J	54,360 J	27,640	29,590	24,550	17,640	22,780	2,295	6,180	14,570	49,960	262.1 J	3,434	8,490 J	22,870	89.1 J	2,329 J
Total PAHs in ug/kg	4,022	90,030	27,896 J	304,960 J	176,640	184,890	123,750	75,710	145,780	8,274	37,770	105,770	536,860	1,548 J	23,414	68,460 J	110,070	848.1 J	20,539 J
Other (Non-PAH) Semivolatiles																			
1,2,4-Trichlorobenzene in ug/kg	31																		
1,2-Dichlorobenzene in ug/kg	35																		
1,3-Dichlorobenzene in ug/kg	842																		
1,4-Dichlorobenzene in ug/kg	110																		
Hexachlorobutadiene in ug/kg	11																		
Volatile Organic Compounds (VOC)																			
1,1,1,2-Tetrachloroethane in ug/kg																			
1,1,1-Trichloroethane in ug/kg	856																		
1,1,2 - Trichlorotrifluoroethane in ug/kg																			
1,1,2,2-Tetrachloroethane in ug/kg	202																		
1,1,2-Trichloroethane in ug/kg	570																		
1,1-Dichloroethane in ug/kg	0.575																		
1,1-Dichloroethene in ug/kg	2,780																		
1,1-Dichloropropene in ug/kg																			
1,2,3-Trichlorobenzene in ug/kg	858																		
1,2,3-Trichloropropane in ug/kg																			
1,2,4-Trimethylbenzene in ug/kg																			
1,2-Dibromo-3-chloropropane in ug/kg																			
1,2-Dibromoethane (EDB) in ug/kg																			
1,2-Dichloroethane (EDC) in ug/kg	260																		
1,2-Dichloropropane in ug/kg	333																		
1,3,5-Trimethylbenzene in ug/kg																			
1,3-Dichloropropane in ug/kg																			
1,4-Dichloro-2-Butene in ug/kg																			
2,2-Dichloropropane in ug/kg																			
2-Butanone in ug/kg	42.4																		
2-Chloroethyl Vinyl Ether in ug/kg																			

Table F-3A - Sediment Quality Data - 2013 Removal Evaluation

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	BGW-RE-SG-13 7/8/13 (0-4 in)	BGW-RE-SG-14 7/8/13 (0-4 in)	BGW-RE-SG-15 7/8/13 (0-4 in)	BGW-RE-SG-15 FD 7/8/13 (0-4 in)	BGW-RE-SG-15 7/8/13 (4-10 in)	BGW-RE-SG-16 7/8/13 (0-4 in)	BGW-RE-SG-17 7/8/13 (0-4 in)	BGW-RE-SG-17 7/8/13 (4-9 in)	BGW-RE-SG-18 7/8/13 (0-4 in)	BGW-RE-SG-19 7/8/13 (0-4 in)	BGW-RE-SG-19 7/8/13 (4-8 in)	BGW-RE-SG-20 7/8/13 (0-4 in)	BGW-RE-SG-21 7/8/13 (0-4 in)	BGW-RE-SG-22 7/8/13 (0-4 in)	BGW-RE-SG-22 7/8/13 (4-10 in)	BGW-RE-SG-23 7/8/13 (0-4 in)	BGW-RE-SG-24 7/8/13 (0-4 in)	BGW-RE-SG-25 7/8/13 (0-4 in)
2-Chlorotoluene in ug/kg																			
2-Hexanone in ug/kg	58.2																		
4-Chlorotoluene in ug/kg																			
4-Methyl-2-pentanone in ug/kg	25.1																		
Acetone in ug/kg	9.9																		
Acrolein in ug/kg	0.00152																		
Acrylonitrile in ug/kg	1.2																		
Benzene in ug/kg	137																		
Bromobenzene in ug/kg																			
Bromochloromethane in ug/kg																			
Bromodichloromethane in ug/kg																			
Bromoethane in ug/kg																			
Bromoform in ug/kg	1,310																		
Bromomethane in ug/kg	1.37																		
Carbon disulfide in ug/kg	0.851																		
Carbon tetrachloride in ug/kg	7,240																		
Chlorobenzene in ug/kg	162																		
Chloroethane in ug/kg																			
Chloroform in ug/kg	121																		
Chloromethane in ug/kg																			
cis-1,2-Dichloroethene (DCE) in ug/kg																			
cis-1,3-Dichloropropene in ug/kg																			
Dibromochloromethane in ug/kg																			
Dibromomethane in ug/kg																			
Ethylbenzene in ug/kg	305																		
Isopropylbenzene in ug/kg	86																		
Methylene chloride in ug/kg	159																		
Methyliodide in ug/kg																			
n-Butylbenzene in ug/kg																			
n-Propylbenzene in ug/kg																			
p-Isopropyltoluene in ug/kg																			
sec-Butylbenzene in ug/kg																			
Styrene in ug/kg	7,070																		
tert-Butylbenzene in ug/kg																			
Tetrachloroethene (PCE) in ug/kg	190																		
Toluene in ug/kg	1,090																		
trans-1,2-Dichloroethene in ug/kg	1,050																		
trans-1,3-Dichloropropene in ug/kg																			
Trichloroethene (TCE) in ug/kg	8,950																		
Trichlorofluoromethane in ug/kg																			
Vinyl acetate in ug/kg	13																		
Vinyl chloride in ug/kg	202																		
m,p-Xylenes in ug/kg																			
o-Xylene in ug/kg																			

Table F-3A - Sediment Quality Data - 2013 Removal Evaluation

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	BGW-RE-SG-25 7/8/13 (4-12 in)	BGW-RE-SG-26 7/8/13 (0-4 in)	BGW-RE-SG-27 7/8/13 (0-4 in)	BGW-RE-SG-28 7/8/13 (0-4 in)	BGW-RE-SG-29 7/8/13 (0-4 in)	BGW-RE-SG-30 7/8/13 (0-4 in)	BGW-RE-SG-31 8/7/13 (0-4 in)	BGW-RE-SG-32 8/7/13 (0-4 in)	BGW-RE-SG-33 8/7/13 (0-4 in)	BGW-RE-SG-34 8/7/13 (0-4 in)	BGW-RE-SG-35 8/7/13 (0-4 in)	BGW-RE-SG-36 8/7/13 (0-4 in)	BGW-RE-SG-37 8/7/13 (0-4 in)	BGW-RE-SG-38 8/7/13 (0-4 in)	BGW-RE-SG-38 FD 8/7/13 (0-4 in)	BGW-RE-SG-39 8/7/13 (0-4 in)
Conventional Chemistry Parameters																	
Total Organic Carbon in Percent		1.14	1.15	0.204	0.25	1.1	1.22	0.594	0.779	6.64	2.97	4	4.84	4.57	4.43	4.6	0.208
Total Solids in Percent		81.67	77.33	86.86	86.96	86.78	78.1	89.23	77.08	76.37	83.41	85.12	86.08	84.14	77.79	85.41	76.75
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in ug/kg	500	84 J	200	32	0.4 J	7.2	58	24 J	2,100 J	1,400 J	730 J	3,600 J	230 J	380 J	1,500 J	3,200 J	580 J
Acenaphthylene in ug/kg	1,300	1,300	820	240	5.3	78	270	170 J	2,300	6,100	3,900	4,700	5,500	1,900	6,800	8,000	3,400
Anthracene in ug/kg	960	1,800	990	410	3.4	85	350	190 J	2,000	8,200	5,800	7,000	9,400	2,000	6,800	6,200	2,700
Benzo(g,h,i)perylene in ug/kg	670	6,600	2,500	1,500	39	400	1,200	1,200 J	6,400 J	39,000 J	25,000 J	17,000 J	34,000 J	20,000 J	19,000 J	16,000 J	10,000 J
Dibenzofuran in ug/kg	540	160	140	48	0.9	12	57	17	370	630	300	610	440	150	470	490	270
Fluoranthene in ug/kg	1,700	15,000	6,500	3,200	34	790	2,500	2,700	16,000	77,000	58,000	46,000	62,000	40,000	49,000	43,000	20,000
Fluorene in ug/kg	540	440	400	100	1.8	33	160	89 J	1,400	2,600	1,200	3,800	2,100	570	2,400	1,700	890
Phenanthrene in ug/kg	1,500	4,100	4,300	1,300	15	320	1,600	950	8,600	30,000	18,000	37,000	21,000	8,200	16,000	15,000	9,900
Pyrene in ug/kg	2,600	19,000	9,100	4,000	55	1,100	3,300	2,800	22,000	86,000	57,000	47,000	59,000	39,000	55,000	44,000	24,000
Naphthalene in ug/kg	2,100	1,300	940	320	7.5	74	340	200 J	2,800	4,800	3,400	4,200	2,900	1,700	3,300	3,600	2,800
Benz(a)anthracene in ug/kg	1,300	7,200	2,900	1,500	22	360	1,200	1,200	9,300	38,000	23,000	18,000	35,000	16,000	24,000	20,000	11,000
Benzo(a)pyrene in ug/kg	1,600	8,000	3,000	2,000	34	420	1,600	1,300	8,200	46,000	27,000	21,000	42,000	22,000	26,000	24,000	11,000
Benzo(b)fluoranthene in ug/kg	10,400	4,400	1,800	1,200	21	260	940	770 J	4,800	25,000	15,000	11,000	22,000	12,000	13,000	13,000	6,800
Benzo(k)fluoranthene in ug/kg	240	2,600	940	630	10	140	470	290 J	2,500	14,000	8,100	5,900	12,000	6,200	6,600	6,200	3,300
Chrysene in ug/kg	1,400	8,100	3,200	1,700	28	380	1,400	1,100	8,200	40,000	23,000	18,000	37,000	18,000	23,000	21,000	11,000
Dibenzo(a,h)anthracene in ug/kg	230	1,000	390	280	5.8	72	240	150 J	960	4,300	120	1,800	6,000	1,900	3,400	1,900	1,100
Indeno(1,2,3-cd)pyrene in ug/kg	600	4,400	1,600	1,100	25	280	890	840 J	4,900 J	29,000 J	18,000 J	13,000 J	24,000 J	14,000 J	13,000 J	12,000 J	7,400 J
Total cPAHs TEQ (ND = 0) in ug/kg	1,600	10,634	4,033	2,668	46.7	583.78	2,149	1,735 J	11,093 J	59,680 J	32,824 J	27,077 J	56,257 J	28,180 J	34,489 J	30,483 J	14,664 J
Total cPAHs TEQ (ND = 1/2 RDL) in ug/kg	1,600	10,634	4,033	2,668	46.7	583.78	2,149	1,735 J	11,093 J	59,680 J	32,824 J	27,077 J	56,257 J	28,180 J	34,489 J	30,483 J	14,664 J
Total HPAHs in ug/kg	12,000	78,800	32,900	17,810	284.8	4,362	14,260	12,670 J	86,060 J	412,300 J	262,820 J	205,200 J	346,000 J	195,700 J	239,900 J	208,700 J	109,600 J
Total LPAHs in ug/kg	5,200	9,024 J	7,650	2,402	33.4 J	597.2	2,778	1,623 J	19,200 J	53,100 J	33,030 J	60,300 J	41,130 J	14,750 J	36,800 J	37,700 J	20,270 J
Total PAHs in ug/kg	4,022	87,824 J	40,550	20,212	318.2 J	4,959	17,038	14,293 J	105,260 J	465,400 J	295,850 J	265,500 J	387,130 J	210,450 J	276,700 J	246,400 J	129,870 J
Other (Non-PAH) Semivolatiles																	
1,2,4-Trichlorobenzene in ug/kg	31																
1,2-Dichlorobenzene in ug/kg	35																
1,3-Dichlorobenzene in ug/kg	842																
1,4-Dichlorobenzene in ug/kg	110																
Hexachlorobutadiene in ug/kg	11																
Volatile Organic Compounds (VOC)																	
1,1,1,2-Tetrachloroethane in ug/kg																	
1,1,1-Trichloroethane in ug/kg	856																
1,1,2 - Trichlorotrifluoroethane in ug/kg																	
1,1,2,2-Tetrachloroethane in ug/kg	202																
1,1,2-Trichloroethane in ug/kg	570																
1,1-Dichloroethane in ug/kg	0.575																
1,1-Dichloroethene in ug/kg	2,780																
1,1-Dichloropropene in ug/kg																	
1,2,3-Trichlorobenzene in ug/kg	858																
1,2,3-Trichloropropane in ug/kg																	
1,2,4-Trimethylbenzene in ug/kg																	
1,2-Dibromo-3-chloropropane in ug/kg																	
1,2-Dibromoethane (EDB) in ug/kg																	
1,2-Dichloroethane (EDC) in ug/kg	260																
1,2-Dichloropropane in ug/kg	333																
1,3,5-Trimethylbenzene in ug/kg																	
1,3-Dichloropropane in ug/kg																	
1,4-Dichloro-2-Butene in ug/kg																	
2,2-Dichloropropane in ug/kg																	
2-Butanone in ug/kg	42.4																
2-Chloroethyl Vinyl Ether in ug/kg																	

Table F-3A - Sediment Quality Data - 2013 Removal Evaluation

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	BGW-RE-SG-25 7/8/13 (4-12 in)	BGW-RE-SG-26 7/8/13 (0-4 in)	BGW-RE-SG-27 7/8/13 (0-4 in)	BGW-RE-SG-28 7/8/13 (0-4 in)	BGW-RE-SG-29 7/8/13 (0-4 in)	BGW-RE-SG-30 7/8/13 (0-4 in)	BGW-RE-SG-31 8/7/13 (0-4 in)	BGW-RE-SG-32 8/7/13 (0-4 in)	BGW-RE-SG-33 8/7/13 (0-4 in)	BGW-RE-SG-34 8/7/13 (0-4 in)	BGW-RE-SG-35 8/7/13 (0-4 in)	BGW-RE-SG-36 8/7/13 (0-4 in)	BGW-RE-SG-37 8/7/13 (0-4 in)	BGW-RE-SG-38 8/7/13 (0-4 in)	BGW-RE-SG-38 FD 8/7/13 (0-4 in)	BGW-RE-SG-39 8/7/13 (0-4 in)
2-Chlorotoluene in ug/kg																	
2-Hexanone in ug/kg	58.2																
4-Chlorotoluene in ug/kg																	
4-Methyl-2-pentanone in ug/kg	25.1																
Acetone in ug/kg	9.9																
Acrolein in ug/kg	0.00152																
Acrylonitrile in ug/kg	1.2																
Benzene in ug/kg	137																
Bromobenzene in ug/kg																	
Bromochloromethane in ug/kg																	
Bromodichloromethane in ug/kg																	
Bromoethane in ug/kg																	
Bromoform in ug/kg	1,310																
Bromomethane in ug/kg	1.37																
Carbon disulfide in ug/kg	0.851																
Carbon tetrachloride in ug/kg	7,240																
Chlorobenzene in ug/kg	162																
Chloroethane in ug/kg																	
Chloroform in ug/kg	121																
Chloromethane in ug/kg																	
cis-1,2-Dichloroethene (DCE) in ug/kg																	
cis-1,3-Dichloropropene in ug/kg																	
Dibromochloromethane in ug/kg																	
Dibromomethane in ug/kg																	
Ethylbenzene in ug/kg	305																
Isopropylbenzene in ug/kg	86																
Methylene chloride in ug/kg	159																
Methyliodide in ug/kg																	
n-Butylbenzene in ug/kg																	
n-Propylbenzene in ug/kg																	
p-Isopropyltoluene in ug/kg																	
sec-Butylbenzene in ug/kg																	
Styrene in ug/kg	7,070																
tert-Butylbenzene in ug/kg																	
Tetrachloroethene (PCE) in ug/kg	190																
Toluene in ug/kg	1,090																
trans-1,2-Dichloroethene in ug/kg	1,050																
trans-1,3-Dichloropropene in ug/kg																	
Trichloroethene (TCE) in ug/kg	8,950																
Trichlorofluoromethane in ug/kg																	
Vinyl acetate in ug/kg	13																
Vinyl chloride in ug/kg	202																
m,p-Xylenes in ug/kg																	
o-Xylene in ug/kg																	

Notes

Concentrations in shaded cells indicate value exceeds the Sediment PRG.

J = Analyte was positively identified. The reported result is an estimate.

PRG = preliminary remediation goal

U = Analyte was not detected at or above the reported result.

Table F-3B - Sediment Quality Data - E+E 2008 Brownfields

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	WN01 6/4/08 (0-6 ft)	WN02 6/4/08 (0-6 ft)	WN03 6/4/08 (0-6 ft)	WN04 6/4/08 (0-6 ft)	WN05 6/4/08 (0-6 ft)
Total Petroleum Hydrocarbons (TPH)						
Gasoline Range Hydrocarbons in ug/kg		450,000 U	6,000 U	25,000 U	5,000 U	5,000 U
Diesel Range Hydrocarbons in ug/kg		210,000 J	140,000 J	240,000 J	63,000 J	25,000 U
Oil Range Hydrocarbons in ug/kg		450,000 J	460,000 J	620,000 J	210,000 J	21,000 J
Metals						
Aluminum in ug/kg		9,030,000 J	7,130,000 J	7,640,000 J	6,290,000 J	6,020,000 J
Antimony in ug/kg	2,000	3,900 J				
Arsenic in ug/kg	57,000	2,300	2,300	5,100	2,600 J	1,500 J
Barium in ug/kg		19,100 J	30,200 J	47,000 J	16,600 J	13,300 J
Beryllium in ug/kg		2,700	2,100	2,300	2,000	1,900
Cadmium in ug/kg	5,100	700 U	600 U	700 U	500 U	500 U
Calcium in ug/kg		33,600,000 J	5,530,000 J	17,200,000 J	6,140,000 J	2,390,000 J
Chromium (Total) in ug/kg	260,000	21,200 J	19,300 J	20,200 J	17,500 J	16,600 J
Cobalt in ug/kg	50,000	3,700 J	3,900 J	26,300	3,500 J	3,000 J
Copper in ug/kg	390,000	26,700	22,100	71,700	13,500	8,600
Iron in ug/kg	20,000,000	12,500,000 J	14,000,000 J	15,900,000 J	11,400,000 J	9,730,000 J
Lead in ug/kg	450,000	16,100 J	19,400 J	30,000 J	10,100 J	8,900 J
Magnesium in ug/kg		4,210,000	4,640,000	3,970,000	4,110,000	3,350,000
Manganese in ug/kg	460,000	168,000	180,000	166,000	135,000	174,000
Mercury in ug/kg	410	27.8 J	28 J			100 J
Nickel in ug/kg	20,900	26,700 J	33,500 J	52,600 J	25,300 J	21,400 J
Potassium in ug/kg		603,000 J	563,000 J	494,000 J	497,000 J	415,000 J
Selenium in ug/kg	2,000	4,800 U	4,400 U	400 J	3,500 U	3,500 U
Silver in ug/kg	6,100	1,400 U	1,300 U	1,000 U	1,000 U	1,000 U
Sodium in ug/kg		1,390,000	996,000	1,560,000	1,930,000	605,000
Thallium in ug/kg		3,400 U	3,100 U	2,500 U	2,500 U	2,500 U
Vanadium in ug/kg		29,800	27,800	36,500	25,000	21,600
Zinc in ug/kg	410,000	79,900 J	57,400 J	78,900 J	36,500 J	23,200 J
Polycyclic Aromatic Hydrocarbons (PAHs)						
Acenaphthene in ug/kg	500	380	73	240	97	15
Acenaphthylene in ug/kg	1,300	1,100	1,500	1,700	1,300	230
Anthracene in ug/kg	960	990	1,300	2,300	1,700	140
Benzo(g,h,i)perylene in ug/kg	670	2,100	2,700	3,000	3,800	380
Dibenzofuran in ug/kg	540	74	58	71	69	25 U
Fluorene in ug/kg	540	450	630	770	780	13
Phenanthrene in ug/kg	1,500	2,200	1,900	24,000	8,100 J	430
Pyrene in ug/kg	2,600	5,200	7,100	7,500	1,300	500
2-Methylnaphthalene in ug/kg	670	1,200	470	370	380	19
Naphthalene in ug/kg	2,100	1,300	490	560	300	17 J
Benz(a)anthracene in ug/kg	1,300	3,700	3,200	920	5,600	660
Benzo(a)pyrene in ug/kg	1,600	3,600	3,700	3,400	6,300	410
Benzo(b)fluoranthene in ug/kg	10,400	2,000	2,000	3,100	3,400	440
Benzo(k)fluoranthene in ug/kg	240	2,200	2,600	1,300	3,600	340
Chrysene in ug/kg	1,400	3,400 J	3,500	17,000	6,000	640
Dibenzo(a,h)anthracene in ug/kg	230	600	700 DJ	870	860	150
Indeno(1,2,3-cd)pyrene in ug/kg	600	2,000	2,000	3,100	3,200	360
Total cPAHs TEQ (ND = 0) in ug/kg	1,600	4,680	4,790	4,500	8,030	611
Total cPAHs TEQ (ND = 1/2 RDL) in ug/kg	1,600	4,680	4,790	4,500	8,030	611

Table F-3B - Sediment Quality Data - E+E 2008 Brownfields

Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	WN01 6/4/08 (0-6 ft)	WN02 6/4/08 (0-6 ft)	WN03 6/4/08 (0-6 ft)	WN04 6/4/08 (0-6 ft)	WN05 6/4/08 (0-6 ft)
Other (Non-PAH) Semivolatiles						
1,1'-Biphenyl in ug/kg	1,220	110	71	90	60	25 U
1,2,4,5-Tetrachlorobenzene in ug/kg	47,000	25 U	26 U	27 U	25 U	25 U
1,2,4-Trichlorobenzene in ug/kg	31	6.6 U	9 U	7.8 U	6.8 U	7.1 U
1,2-Dichlorobenzene in ug/kg	35	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,3-Dichlorobenzene in ug/kg	842	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,4-Dichlorobenzene in ug/kg	110	17 J	23 J	21 J	22 J	23 J
1,4-Dioxane in ug/kg	119	130 U	180 U	160 U	140 U	140 U
2,3,4,6-Tetrachlorophenol in ug/kg	284	25 U	26 U	27 U	25 U	25 U
2,4,5-Trichlorophenol in ug/kg	819	25 U	26 U	27 U	25 U	25 U
2,4,6-Trichlorophenol in ug/kg	2,650	25 U	26 U	27 U	25 U	25 U
2,4-Dichlorophenol in ug/kg	117	25 U	26 U	27 U	25 U	25 U
2,4-Dimethylphenol in ug/kg	29	25 U	26 U	27 U	25 U	25 U
2,4-Dinitrophenol in ug/kg	6.21	120 UJ	130 U	130 UJ	120 UJ	120 UJ
2-Chloronaphthalene in ug/kg	417	25 U	26 U	27 U	25 U	25 U
2-Chlorophenol in ug/kg	344	25 U	26 U	27 U	25 U	25 U
2-Nitroaniline in ug/kg		50 UJ	51 U	53 U	49 U	50 U
2-Nitrophenol in ug/kg		25 U	26 U	27 U	25 U	25 U
3,3'-Dichlorobenzidine in ug/kg	2,060	25 U	26 U	27 U	25 U	25 U
3-Nitroaniline in ug/kg		50 UJ	51 U	53 U	49 U	50 U
4,6-Dinitro-2-methylphenol in ug/kg	104	50 U	51 U	53 U	49 U	50 U
4-Bromophenyl phenyl ether in ug/kg	1,230	25 U	26 U	27 U	25 U	25 U
4-Chloro-3-methylphenol in ug/kg	388	25 U	26 U	27 U	25 U	25 U
4-Chloroaniline in ug/kg	146	25 U	26 U	27 U	25 U	25 U
4-Chlorophenyl phenyl ether in ug/kg		25 U	26 U	27 U	25 U	25 U
4-Methylphenol in ug/kg	670	25 U	17 J	17 J	25 U	25 U
4-Nitroaniline in ug/kg		50 UJ	51 U	53 U	49 U	50 U
4-Nitrophenol in ug/kg	13.3	50 UJ	51 U	53 U	49 U	50 U
Acetophenone in ug/kg		25 U	26 U	27 U	25 U	25 U
Atrazine in ug/kg	6.62	25 U	26 U	27 U	25 U	25 U
Benzaldehyde in ug/kg		25 U	26 U	38	25 U	19 J
Benzidine in ug/kg		25 U	26 U	27 U	25 U	25 U
Benzyl butyl phthalate in ug/kg	63	25 U	26 U	27 U	25 U	25 U
Bis(2-chloro-1-methylethyl) ether in ug/kg		25 U	26 U	27 U	25 U	25 U
Bis(2-chloroethoxy)methane in ug/kg		25 U	26 U	27 U	25 U	25 U
Bis(2-chloroethyl) ether in ug/kg	3,520	25 U	26 U	27 U	25 U	25 U
Bis(2-ethylhexyl) phthalate in ug/kg	1,300	25 U	26 U	27 U	25 U	42
Caprolactam in ug/kg		25 U	26 U	27 U	25 U	25 U
Carbazole in ug/kg		110	100	110	69	25 U
Diethyl phthalate in ug/kg	200	25 U	26 U	27 U	25 U	25 U
Dimethyl phthalate in ug/kg	71	25 U	26 U	27 U	25 U	25 U
Di-n-butyl phthalate in ug/kg	1,400	25 U	26 U	27 U	25 U	25 U
Di-n-octyl phthalate in ug/kg	6,200	25 U	26 U	27 U	25 U	25 U
Hexachlorobenzene in ug/kg	22	25 U	26 U	27 U	25 U	25 U
Hexachlorobutadiene in ug/kg	11	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Hexachlorocyclopentadiene in ug/kg	139	62 UJ	64 U	67 UJ	61 UJ	62 UJ
Hexachloroethane in ug/kg	804	2.7 U	3.6 U	3.1 U	2.7 U	2.8 U
Isophorone in ug/kg	432	25 U	26 U	27 U	25 U	25 U
N-Nitrosodimethylamine in ug/kg		25 U	26 U	27 U	25 U	25 U
N-Nitroso-di-n-propylamine in ug/kg		25 U	26 U	27 U	25 U	25 U
N-Nitrosodiphenylamine in ug/kg	28	25 U	26 U	27 U	25 U	25 U
Pentachlorophenol in ug/kg	360	37	54	110	47	35 J
Phenol in ug/kg	420	25 U	26 U	27 UJ	25 U	25 U

Table F-3B - Sediment Quality Data - E+E 2008 Brownfields
Bremerton Gas Works Site
Bremerton, Washington

Chemical Name	Sediment Initial PRG	WN01 6/4/08 (0-6 ft)	WN02 6/4/08 (0-6 ft)	WN03 6/4/08 (0-6 ft)	WN04 6/4/08 (0-6 ft)	WN05 6/4/08 (0-6 ft)
Volatile Organic Compounds (VOC)						
1,1,1,2-Tetrachloroethane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,1,1-Trichloroethane in ug/kg	856	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,1,2 - Trichlorotrifluoroethane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,1,2,2-Tetrachloroethane in ug/kg	202	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,1,2-Trichloroethane in ug/kg	570	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,1-Dichloroethane in ug/kg	0.575	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,1-Dichloroethene in ug/kg	2,780	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,2,3-Trichlorobenzene in ug/kg	858	6.6 U	9 U	7.8 U	6.8 U	7.1 U
1,2,3-Trichloropropane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,2,4-Trimethylbenzene in ug/kg		18 J	26 U	27 U	15 J	25 U
1,2-Dibromo-3-chloropropane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,2-Dibromoethane (EDB) in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,2-Dichloroethane (EDC) in ug/kg	260	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,2-Dichloropropane in ug/kg	333	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
1,3,5-Trimethylbenzene in ug/kg		25 U	26 U	27 U	21 J	25 U
2-Butanone in ug/kg	42.4	6.6 U	9 U	7.8 U	6.8 U	7.1 U
2-Hexanone in ug/kg	58.2	6.6 U	9 U	7.8 U	6.8 U	7.1 U
4-Methyl-2-pentanone in ug/kg	25.1	6.6 U	9 U	7.8 U	6.8 U	7.1 U
Acetone in ug/kg	9.9	6.6 U	9 U	28	6.8 U	7.1 U
Benzene in ug/kg	137	7.4	1.8 U	1.5 J	1.4 U	1.4 U
Bromochloromethane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Bromodichloromethane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Bromoform in ug/kg	1,310	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Bromomethane in ug/kg	1.37	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Carbon disulfide in ug/kg	0.851	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Carbon tetrachloride in ug/kg	7,240	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Chlorobenzene in ug/kg	162	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Chloroethane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Chloroform in ug/kg	121	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Chloromethane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
cis-1,2-Dichloroethene (DCE) in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
cis-1,3-Dichloropropene in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Cyclohexane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Dibromochloromethane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Dichlorodifluoromethane in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Ethylbenzene in ug/kg	305	2.3	1.8 U	1.6 U	1.4 U	1.4 U
Isopropylbenzene in ug/kg	86	0.48 J	1.8 U	1.6 U	1.4 U	1.4 U
Methyl acetate in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Methyl tert-butyl ether (MTBE) in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Methylcyclohexane in ug/kg		0.65 J	1.8 U	1.6 U	1.4 U	1.4 U
Methylene chloride in ug/kg	159	1.3 UJ	1.8 J	1.6 UJ	1.4 UJ	1.4 UJ
Styrene in ug/kg	7,070	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Tetrachloroethene (PCE) in ug/kg	190	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Toluene in ug/kg	1,090	0.51 J	1.8 U	1.6 U	1.4 U	1.4 U
trans-1,2-Dichloroethene in ug/kg	1,050	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
trans-1,3-Dichloropropene in ug/kg		1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Trichloroethene (TCE) in ug/kg	8,950	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
Trichlorofluoromethane in ug/kg		1.3 UJ	1.8 UJ	1.6 UJ	1.4 UJ	1.4 UJ
Vinyl chloride in ug/kg	202	1.3 U	1.8 U	1.6 U	1.4 U	1.4 U
m,p-Xylenes in ug/kg		2.9	1.8 U	1.6 U	1.4 U	1.4 U
o-Xylene in ug/kg		5.7	1.8 U	1.6 U	1.4 U	1.4 U

Notes
Concentrations in shaded cells indicate value exceeds the Sediment PRG
J = Analyte was positively identified. The reported result is an estimate.
PRG = preliminary remediation goal
U = Analyte was not detected at or above the reported result.

APPENDIX G

Site Health and Safety Plan (Aspect Consulting, LLC)

PROJECT-SPECIFIC HEALTH AND SAFETY PLAN

Property Name:	Former Bremerton Gas Works Property		
Project Number:	080239		
Prepared By:	Robert Hanford	Date:	4/13/2015
Reviewed By:	Carla Brock	Date:	4/14/2015

1 INTRODUCTION

This project-specific health and safety plan establishes procedures and practices to protect employees of Aspect Consulting, LLC (Aspect) from potential hazards posed by field activities at the subject site. In this health and safety plan, measures are provided to minimize potential exposure, accidents, and physical injuries that may occur during daily activities and adverse conditions. Contingency arrangements are also provided for emergency situations.

2 EMERGENCY CONTACT INFORMATION

PROPERTY LOCATION	Former Bremerton Gas Works Property 1725 Pennsylvania Avenue Bremerton, WA 98337
NEAREST HOSPITAL	Harrison Medical Center 2520 Cherry Avenue Bremerton, WA 98310 360-377-3911 **ATTACHED FIGURE SHOWS ROUTE TO HOSPITAL.**
EMERGENCY RESPONDERS	Police, Ambulance, Fire ………………………………………**911**
OTHER CONTACTS	Aspect, Bob Hanford (mobile)...…………..………..(206) 276-9256 Aspect, Seattle Office ………………………….….…(206) 328-7443 Cascade, Kalle Godel……………..…………….…..(701) 471-0297 EPA, William Ryan ………………………….…..….(206) 553-8561
IN EVENT OF EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: ✓ **Where You Are:** address, cross streets, or landmarks ✓ **Phone Number** you are calling from ✓ **What Happened:** type of accident, injury ✓ **How Many Persons** need help ✓ **What is Being Done** for the victims ✓ **You Hang Up Last:** let whomever you called hang up first

In case of serious injuries or other emergency, immediately call Bob Hanford, Aspect Corporate Safety Officer, at (206) 780-7729 or (206)-276-9256. If no response, call Doug Hillman at (206) 328-7443 or Tim Flynn at (206) 780-9370.

3 PERSONNEL ORGANIZATION AND CHAIN OF COMMAND

The Aspect Project Manager assigns the Site Safety Supervisor and other field personnel for this project, and has ultimate responsibility for developing this project-specific health and safety plan and ensuring it is complied with during project execution. The Aspect Site Safety Supervisor has responsibility and authority for Aspect employees' safety during site activities. Other Aspect personnel on site have the responsibility to comply with this project-specific health and safety plan in coordination with the Site Safety Supervisor.

Aspect Personnel			
Role	**Name**	**Office Phone**	**Mobile/Cell Phone**
Project Manager	Jeremy Porter	206-838-5835	206-790-2129
Project Geologist	Carla Brock	206-838-6593	206-755-9934
Site Safety Supervisor	Bob Hanford	206-780-7729	206-276-9556
Other Field Personnel	Amy Tice	206-838-6585	206-334-7690
Other Field Personnel	Aaron Pruitt	206-838-6587	206-595-6615
Other Field Personnel	Simon Butler	206-838-5843	802-793-0983
Aspect's Subcontractors Working On Site			
Name	**Task/Role**	**Contact**	**Phone**
Applied Professional Service	Private utility locate	Bill Phillips	206-571-1857
Holt Services	Drilling, well installation	Dale Smith	253-604-4878
Clearcreek Contractors	Test pits	Mark McCullough	360-659-2459

Aspect will inform its subcontractors working onsite of potential fire, explosion, health, safety or other hazards associated with planned site activities, and can make available to them this project-specific health and safety plan. **However, all subcontractors are solely responsible for preparation of their own health and safety plan, and for the safety of their employees.**

4 SITE CONTROL PLAN

4.1 Property Description

Property Name:	Former Bremerton Gas Works Property	
Property Location or Address:	1725 Pennsylvania Avenue, Bremerton, WA	
Owners/Tenants:	Paul McConkey, Natacha Sesko	
Current Property Use:	Misc. Equipment Storage/Vacant	
Past Use of Property (if different):	Manufactured gas plant (coal and oil), equipment and boat storage and maintenance facility	
Designated Hazardous Waste Site?	yes	Federal: Yes
Industrial Site?	yes	
Topography:	Gently sloping to the north with a steep 3V:1H slope to the shoreline	
Surround Land Use/Nearest Population:	Mixed commercial and residential	

Drinking Water/Sanitary Facilities:	None currently on site. There will be portable equipment available when site activities start.
Site Map:	Available in Remedial Investigation/Feasibility Study Work Plan

4.2 Site Access Control

Describe controls to be used to prevent entry by unauthorized persons:

- The property is closed to the public (fenced with secured gate).
- Traffic cones, barriers, chain-link fence, and caution tape, as needed.

Describe how exclusion zones and contamination reduction zones will be designated:

- Drilling and test pit activities will be performed in multiple areas of the property.
- The area immediately adjacent to each boring/monitoring well/test pit location will be considered an exclusion zone.
- The subcontractor will mark the limits of the exclusion zone using cones, caution tape, etc.
- The contamination reduction zone will be located adjacent to the driller's/excavation contractor's mobile decontamination trailer, and will include steam cleaning equipment for equipment decontamination.
- Aspect field personnel will remain vigilant about preventing unauthorized persons from approaching the exclusion zone.

4.3 Worker Hygiene Practices

Aspect personnel will use the following hygiene practices while working on site:

- No person will eat, drink, chew gum or tobacco in potentially contaminated areas. Drinking of replacement fluids for heat stress control will be permitted only in areas that are free from contamination, except in emergency situations.
- Smoking is prohibited except in designated areas of the site.
- Long hair will be secured away from the face so that it does not interfere with any activities.
- All personnel leaving potentially contaminated areas will wash their hands and face prior to entering any eating areas.
- Personnel leaving potentially contaminated areas will shower (including washing hair) and change to clean clothing as soon as practical after leaving the property.

4.4 Emergency Communications

Aspect workers on site will have a mobile (cell) phone on site, which will be used for communications should an emergency arise. Phone numbers for Aspect site personnel are listed in Section 3: Personnel Organization and Chain of Command.

4.5 Nearest Medical Assistance

FIRST CALL 911. The route from the site to the nearest hospital is shown in the attached figure.

5 SITE WORK PLAN

Proposed Work Activities On Site:	• Geophysical ground survey using EM and GPR technologies. • Direct push drilling exploration. • Hollow stem auger or sonic drilling, well installation and development. • Test pit exploration. • Groundwater sampling. • Slope reconnaissance and seep sampling.
Objectives of Site Activities:	Remedial investigation to describe the nature and extent of potential site contamination.
Proposed Work Dates:	August 2015 through June 2016
Will On-site Personnel Potentially be Exposed to Hazardous Substances?	If yes, describe: The property historically included a manufactured gas plant. Surrounding facilities included two petroleum bulk plants with fuel unloading from marine ships and barges. Based on previous site investigations by others, potential chemical hazards include: • Petroleum hydrocarbons including polycyclic aromatic hydrocarbons (PAHs) and aromatic volatile organic compounds; • Creosote; and • Heavy metals (arsenic, lead and chromium).
Do Personnel Conducting Site Activities have Training in Accordance with WAC 296-843-200?	Yes

6 DECONTAMINATION

Goals	Procedures
To prevent the distribution of contaminants outside the exclusion zone or cross-contamination of samples, the following procedures will be used to decontaminate sample equipment.	• Decontamination process involving Alconox wash, tap water rinse, and deionized water rinse (with air dry). • Hexane rinse may be used only to remove organic chemicals that cannot be removed efficiently with soap and water (e.g., petroleum product). • Dedicated tubing used for groundwater sampling will be disposed of or retained (bagged) for future use, but not decontaminated.
To prevent the distribution of contaminants outside the exclusion zone, unnecessary vehicles will not be allowed inside the exclusion zone. For vehicles required in the exclusion zone (e.g., drill rig, excavator), the following decontamination procedures will be used to prevent contamination from leaving the exclusion zone:	• Steam clean drilling equipment and excavator bucket that advances below ground surface.
To minimize or prevent worker exposure to hazardous substances, all personnel working in the exclusion zone and contamination reduction zones will comply with the following decontamination procedures:	• Wash boots and rain gear that have come into contact with soil or groundwater with Alconox/tap water and air dry. • Dispose of disposable personal protective equipment (PPE such as gloves, Tyvek) into Department of Transportation (DOT) approved and appropriately labeled 55-gallon drums. • To prevent distribution of contaminants outside the exclusion zone, do not allow unnecessary vehicles inside the exclusion zone.
Soil cuttings, monitoring well purge water, and decontamination wastewater will be managed in the following manner:	• Soil will be stored in DOT-approved 55-gallon drums (appropriately labeled) at the sample location for future disposal by Cascade Natural Gas Corporation. • Combine decontamination wastewater and monitoring well purge water from locations with evidence of contamination in DOT-approved 55-gallon drums at the property for future disposal by Cascade Natural Gas Corporation.

7 HAZARD ANALYSIS

The potential hazards and corresponding control measures for planned site work activities are as follows:

Work Activity	Primary Potential Hazards	Control Measures
Geophysical survey	• Slip, trips and falls	• Clear survey lines of vegetation and debris prior to survey.
Drilling borings/monitoring wells, soil sampling	• Getting hit by drill rig equipment, especially from overhead.	• Stay back from rig whenever possible and stay alert. • Modified Level D PPE (with hard hat, traffic vest, steel-toe boots).
	• Excessive noise.	• Wear hearing protection.
	• Chemical exposure (skin contact, ingestion, inhalation).	• Modified Level D PPE. • Air monitoring.
Test pits, soil sampling	• Getting hit by excavator.	• Wear traffic vest. • Stay back from excavator and maintain eye contact with operator.
	• Falling into open excavation.	• Do not enter excavation >4 feet deep unless properly shored or sloped. • Stay back from unstable slopes. • Sample from excavator bucket where needed.
	• Chemical exposure (skin contact, ingestion, inhalation).	• Modified Level D PPE. • Air monitoring.
Soil sampling by hand augers or surface grabs	• Chemical exposure (skin contact, ingestion, inhalation).	• Modified Level D PPE. • Air monitoring.
Well development and groundwater sampling	• Chemical exposure (skin or eye contact, ingestion).	• Modified Level D PPE. • Securely join pump tubing and other connectors.
All	• Getting hit by other trucks working on the property.	• Wear traffic vest. • Stay back from roads and stay alert.
	• Steep slopes	• Use extreme caution and buddy system for slope reconnaissance. Improve access as need if monitoring stations are established.
	• Heat stress and hypothermia	• Take breaks, seek shade, adjust schedule, and increase fluid intake. Dress appropriately for weather conditions

Potentially Hazardous Chemicals Known or Suspected at the Property and Permissible Exposure Limits (air)					
Substance	**Medium**	**OHSA PEL**	**OSHA STEL**	**IDLH**	**Carcinogen or Other Hazard**
Gasoline-Range Petroleum	Soil, GW	10 ppmv	15 ppmv	250 ppmv	T
Diesel- and Oil-Range Petroleum	Soil, GW	1 ppmv	5 ppmv	500 ppmv	T
cPAHS	Soil, GW	0.2 mg/m^3	--	--	C
Benzene	Soil, GW	1 ppmv	5 ppmv	500 ppmv	C
Toluene	Soil, GW	200 ppmv	--	500 ppmv	T
Ethylbenzene	Soil, GW	100 ppmv	--	800 ppmv	T
Xylenes	Soil, GW	100 ppmv	150 ppmv	900 ppmv	T
Heavy Metals (arsenic, lead, chromium, etc.)	Soil, GW	As: 0.01 mg/m^3 Pb: 0.05 mg/m^3 Cr: 0.5 mg/m^3	As: -- Pb: -- Cr: --	As: 0.01 mg/m^3 Pb: 0.05 mg/m^3 Cr: 0.5 mg/m^3	Arsenic: C

Notes:
-- = none established
C = carcinogen
cPAH = carcinogenic polycyclic aromatic hydrocarbon
GW = groundwater
IDLH = immediately dangerous to life or health
N/A = not applicable/not available
OHSA = Occupational Safety and Health Administration
T = toxic
PEL = permissible exposure level (8-hour time-weighted average)
STEL = short-term exposure level

Chemicals Known or Suspected On-site (check box)			
Chemical Class	**Known**	**Possible**	**Unlikely**
Corrosive (if expected, specify)			x
Ignitable (if expected, specify)		x	
Reactive			x
Volatile		x	
Radioactive			x
Explosive			x
Biological Agent			x
Particulate or Fibers			x
If known or likely, describe:			

8 PERSONAL PROTECTIVE EQUIPMENT

Based on the hazards identified above, the following personal protective equipment (PPE) will be required for the following field activities. This section specifies both an initial level of protection and a more protective (contingency) level or protection, in the event conditions should change. The contingency defines the PPE that will be available on site.

Work Activity	Level of Protection	
	Initial	Contingency
Geophysical survey	D	N/A
Drilling/test pits/soil sampling	D	Mod. D or C
Well development/groundwater sampling	D	Mod. D or C
Sample handling	D	Mod. D or C
Other activities (list): Slope reconnaissance	D	Mod. D or C

Each level of protection will incorporate the following equipment (specify type of protective clothing, boots, gloves, respiratory cartridges or other protection, safety glasses, hardhat, and hearing protection):

Level of Protection	Specific PPE
Level D	Work clothing, traffic vest, rubber (nitrile) gloves, steel toe and shank boots, safety glasses, hearing protection, and hardhat.
Modified D	Level D plus Tyvek coveralls or rain gear, and neoprene outer gloves.
Level C	Level D plus air-purifying respirator with combination organic vapor/HEPA dust cartridges.

NOTE: Project personnel are not permitted to deviate from the specified levels of protection without the prior approval of the Site Safety Supervisor. A traffic vest is not needed if work clothes are suitably visible (e.g., orange/yellow rain gear or white/yellow chemical protective clothing).

9 AIR MONITORING

Air monitoring will be conducted for all subsurface explorations (soil borings, monitoring wells, and test pit excavations) to identify potentially hazardous environments and determine reference or background concentrations. Air monitoring can be used to define exclusion zones. Air monitoring can also be conducted to evaluate relative concentrations of volatile organic chemicals in samples.

The following equipment will be used to monitor air quality in the breathing zone during work activities:

Monitoring Instrument	Calibration Frequency	Parameters of Interest	Sampling Frequency
PID	Daily	Volatile organic compounds	• During collection of each soil sample during drilling. • During trenching.
Detector tube (*specify chemical)*	As required	Benzene	• As needed based on PID monitoring

Use the following action levels to determine the appropriate level of personal protection to be used during field activities:

Monitoring Instrument	Reading in Breathing Zone	Action	Comments
PID	10 PID units above background for 5 minutes	Confirm with detector tube (*specify chemical*) or upgrade to Level C (air-purifying respirator with organic vapor cartridge).	Alternatively, use engineering controls (ventilation) or leave location and return at a later time.
Dectector tube (*specify chemical)*	> PEL	Upgrade to Level C (air-purifying respirator with organic vapor cartridge).	Leave location pending further evaluation by Aspect Corporate Safety Officer.
PID	100 PID units above background for 5 minutes	Leave location pending further evaluation by Aspect Corporate Safety Officer.	

10 SAFETY EQUIPMENT

The following safety equipment will be on site during the proposed field activities:

Other Required Items (check items required)	
First aid kit	x
Eyewash (e.g., bottled water)	x
PID	x
Drinking water	x
Fire extinguisher	x
Brush fan	
Wind sox	x
Other:	

11 SPILL CONTAINMENT

Will the proposed field work include the handling of bulk chemicals?	Yes	No x
If yes, describe spill containment provisions for the property:		

12 CONFINED SPACE ENTRY

Will the proposed field work include confined space entry?	Yes	No x
If yes, attach to this plan the confined space entry checklist and permit.		

13 ASPECT TRAINING AND MEDICAL MONITORING

Aspect employees who perform site work are responsible for understanding potential health and safety hazards of the site. All Aspect site workers will have health and safety training for hazardous waste operations, in accordance with WAC 296-843-200. In addition, Aspect requires medical monitoring for all employees potentially exposed to chemical hazards in concentrations in excess of the permissible exposure limit (PEL) for more than 30 days per year, as required under WAC 296-843-210. Employees who use respirators for their work will have a respirator medical evaluation as required under Chapter 296-842-WAC.

14 DISCLAIMER

Aspect Consulting, LLC does not guarantee the health or safety of any person entering these property. Because of the potentially hazardous nature of this property and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness at this property. The health and safety guidelines in this plan were prepared specifically for this site and should not be used on any other property without prior evaluation by trained health and safety personnel.

Aspect CONSULTING

FIELD SAFETY PLAN CONSENT AGREEMENT

Aspect Consulting Employees

I have reviewed the project specific health and safety plan, dated April 13, 2015 for the Former Bremerton Gas Works Project fieldwork. I understand the purpose of the plan and I consent to adhere to its procedures and guidelines while conducting activities on site that are described in the plan.

Employee Printed Name	Signature	Date

Site Visitors

I have been briefed on the contents of the project-specific health and safety plan. I am responsible for my own health and safety.

Visitor Printed Name and Organization/Company	Signature	Date

FIELD SAFETY MEETING MINUTES

Site Name ______________________________________**Project No.** ______________________

Meeting Location ____

Meeting Date _____________ **Time** ________________ **Conducted by**____________________

Pre-field Work Orientation______ **Weekly Safety Meeting**________ **Other**________________

Subject Discussed ____

____

____

____

Site Safety Supervisor Comments ____

____

____

____

Participants

Printed Name (and company if subcontractor)	Signature

(b) (4)

(b) (4)

APPENDIX H

Site Health and Safety Plan (Anchor QEA, LLC)

Marine Health and Safety Plan
Appendix H of the Draft RI/FS Work Plan

Bremerton Gas Works Site

Prepared for: Cascade Natural Gas Corporation

Aspect Project No. 080239-005 • Anchor QEA Project No. 131014-01.01
April 17, 2015

Prepared by

Aspect Consulting, LLC
401 Second Avenue South, Suite 201
Seattle, Washington 98104

Anchor QEA, LLC
720 Olive Way, Suite 1900
Seattle, Washington 98101

Marine Health and Safety Plan

Appendix H of the Draft RI/FS Work Plan

Bremerton Gas Works Site

Prepared for: Cascade Natural Gas Corporation

Aspect Project No. 080239-005 • Anchor QEA Project No. 131014-01.01
April 17, 2015

Aspect Consulting, LLC & Anchor QEA, LLC

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1 Introduction

Cascade Natural Gas Corporation (Cascade Natural Gas) is conducting a Remedial Investigation/Feasibility Study (RI/FS) at the Bremerton Gas Works Site (Site) in Bremerton, Washington. The work is being conducted under an Administrative Settlement Agreement and Order on Consent (AOC) with the U.S. Environmental Protection Agency (EPA), executed on May 1, 2013.

This Health and Safety Plan (HASP) is designed to protect Anchor QEA, LLC, personnel from physical, chemical, and other hazards posed by site investigation and field sampling efforts detailed at the Site. Field activities covered under this HASP include video surveys, surface and subsurface sediment sampling, surface water sampling and monitoring, beach shellfish surveys, and a tidal current evaluation.

2 Site Description and Project Scope

The Site is located on the north shore of Dyes Inlet in Bremerton, Washington, between Thompson and Pennsylvania Avenues in West Bremerton. Land use in the Site area is currently industrial and light commercial. In 2010, a 12-inch concrete pipe in the intertidal area was observed to be the apparent source of product and intermittent sheens on surface water of Dyes Inlet. A time-critical removal action was conducted at the site to address the leaking pipe and placement of an organo-clay mat over the area in which sheens had been observed. A second time-critical removal action was conducted in 2013 to address migration pathways at the Site that pose a threat to human health, welfare, or the environment. This removal action included removing solid hydrocarbon from the Site and installing an organo-clay mat along the western portion of the beach, plugging Manhole A and a sump drain, and installing required signage.

The current project scope consists of video surveys, surface and subsurface sediment sampling, surface water sampling and monitoring, beach shellfish surveys, and a tidal current evaluation to understand regional trends in sediment and water quality that may affect either current Site conditions or result in future recontamination of the Site.

3 Emergency Response Plan

Because of the health and safety hazards associated with the field sampling and sample handling activities, the potential exists for an emergency to occur. Emergencies may include personal injury, exposure to hazardous substances, fire, explosion, or release of toxic or non-toxic substances (spills). Occupational Safety and Health Administration (OSHA) regulations require that an emergency response plan be available for use onboard to guide actions in emergencies.

Onshore organizations will be relied upon to provide response in emergencies. The local fire department and ambulance service can provide timely response. Anchor QEA personnel and subcontractors will be responsible for identifying an emergency, providing first aid if applicable, notifying the appropriate personnel or agency, and evacuating any hazardous area. Sampling personnel will attempt to control only very minor hazards that could present an emergency, such as a small fire, and will otherwise rely on outside emergency response resources.

The following subsections address key safety personnel, authority and responsibilities of key personnel, and pre-emergency preparation; identify individual(s) who should be notified in case of emergency; provide a list of emergency telephone numbers; offer guidance for particular types of emergencies; and provide directions and a map for getting from the Site to a hospital.

3.1 Key Safety Personnel

The following people share responsibility for health and safety at the Site. The next section includes a description of the role and responsibility of each.

Project Manager: Mark Larsen	Office: 206-287-9130 Cell: (b) (6)
Field Coordinator: Nathan Soccorsy	Office: 206-287-9130 Cell: (b) (6)
Site Supervisor: Tracy Schuh	Office: 206-287-9130 Cell: (b) (6)
Site Safety and Health Officer: Nathan Soccorsy	Office: 206-287-9130 Cell: (b) (6)
Field Personnel: TBD	Cell: TBD

3.2 Authority and Responsibilities of Key Personnel

This section describes the authority and responsibilities of key Anchor QEA personnel. The names and contact information for the following key safety personnel are listed in the previous section of this HASP. Should key site personnel change during the course of the project, a new list will be established and posted immediately at the Site. The emergency phone number for the Site is **911** and should be used first for all medical, fire, and police emergencies.

3.2.1 Project Manager

The project manager (PM) provides overall direction for the project and is responsible for ensuring that the project meets the client's objectives in a safe and timely manner. The PM is responsible for providing qualified staff for the project and adequate resources and budget for the health and safety staff to carry out their responsibilities during the field work. The PM is in regular contact with the field coordinator (FC; see Section 3.2.2) and site safety and health officer (SSHO; see Section 3.2.3) to ensure that appropriate health and safety procedures are implemented into each project task.

The PM has authority to direct response operations; the PM assumes total control over project activities but may assign responsibility for aspects of the project to others. In addition, the PM:

- Oversees the preparation and organization of background review of the project, the work plan, and the field team
- Ensures that the team obtains permission for site access and coordinates activities with appropriate officials
- Briefs the FC and field personnel on specific assignments
- Together with the FC, sees that health and safety requirements are met
- Consults with the SSHO regarding unsafe conditions, incidents, or changes in site conditions or the scope of work

3.2.2 Field Coordinator

The FC reports to the PM and has authority to direct response operations and assumes control over on-site activities. The FC will direct field activities, coordinate the technical and health and safety components of the field program, and is responsible in general for enforcing the HASP and Corporate HASP. The FC will be the primary point of contact for all field personnel and visitors and has direct responsibility for implementation and administration of this HASP. The FC and any field personnel have the authority to stop or suspend work in the event of an emergency, if conditions arise that pose an unacceptable health and safety risk to the personnel or environment, or if conditions arise that warrant revision or amendment of this HASP.

The functions of the FC related to this HASP include but are not necessarily limited to the following:

- Conduct and document daily safety meetings, or designate an alternate FC in his or her absence
- Execute the work plan and schedule
- Periodic field health and safety inspections to ensure compliance with this HASP
- Oversee implementation of safety procedures
- Implement worker protection levels

- Enforce site control measures to ensure that only authorized personnel are allowed on site
- Notify, when necessary, local public emergency officials (all personnel on site may conduct this task as needed)
- Follow-up on incident reports to the PM
- Periodically inspect protective clothing and equipment for adequacy and safety compliance
- See that protective clothing and equipment are properly stored and maintained
- Perform or oversee air monitoring in accordance with this HASP
- Maintain and oversee operation of monitoring equipment and interpretation of data from the monitoring equipment
- Monitor workers for signs of stress, including heat stress, cold exposure, and fatigue.
- Require participants to use the “buddy” system
- Provide (via implementation of this HASP) emergency procedures, evacuation routes, and telephone numbers of the local hospital, poison control center, fire department, and police department
- Communicate incidents promptly to the PM
- Maintain communication with the SSHO on site activities
- If applicable, ensure decontamination and disposal procedures are followed
- Maintain the availability of required safety equipment
- Advise appropriate health services and medical personnel of potential exposures.
- Notify emergency response personnel in the event of an emergency. Coordinate emergency medical care

The FC will record health-and-safety-related details of the project in the field logbook. At a minimum, each day’s entries must include the following information:

- Project name or location
- Names of all on-site personnel
- Level of personal protective equipment (PPE) worn and any other specifics regarding PPE
- Weather conditions
- Type of field work being performed

The FC will have completed the required OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and annual updates, the 8-hour Supervisor training, current first aid and cardiopulmonary resuscitation (CPR) training, and medical monitoring clearance, if applicable. Other certifications or training may be stipulated based on client or site requirements.

3.2.3 Site Safety and Health Officer

Anchor QEA's SSHO will be responsible for managing on-site health and safety activities and will provide support to the PM and FC on health and safety issues. The specific duties of the SSHO are to:

- Provide technical input into the design and implementation of this HASP.
- Advise on the potential for occupational exposure to project hazards, along with appropriate methods and/or controls to eliminate site hazards.
- Ensure that a hazard assessment has been performed and that the adequacy of the PPE selected was evaluated as required by 29 CFR 1910.132(d), 1910.134, 1926.25, and 1926.55, and is duly noted by the signatures and date appearing on the Certification Page of this document.
- Consult with the FC on matters relating to suspending site activities in the event of an emergency.
- Verify that all on-site Anchor QEA personnel and subcontractors have read and signed the HASP Acknowledgement Form.
- Review daily the on-site health and safety activities for effectiveness and modify as needed.
- Verify that corrective actions resulting from deficiencies identified by daily health and safety reviews and observations are implemented and effective.

The SSHO will have completed the required OSHA 40-hour HAZWOPER training and annual updates, the 8-hour Supervisor training, and have medical monitoring clearance, if applicable. In addition, the SSHO will have current training in first aid and CPR.

3.2.4 Field Personnel

All project field personnel will attend a project-specific meeting conducted by the FC concerning safety issues and project work task review before beginning work. All field personnel must be familiar with and comply with this HASP. Subcontractors will be responsible for developing and complying with their own company HASP. The field personnel have the responsibility to immediately report any potentially unsafe or hazardous conditions to the FC. All members of the field personnel have the authority to stop or suspend work if conditions arise that pose an unacceptable health and safety risk to the field personnel or environment or if conditions arise that warrant revision or amendment of this HASP.

The field team reports to the FC for on-site activities and is responsible for

- Reviewing and maintaining a working knowledge of this HASP
- Safe completion of on-site tasks required to fulfill the work plan
- Compliance with the HASP

- Attendance and participation in daily safety meetings
- Notification to the FC of existing or potential safety conditions at the site
- Reporting all incidents to the FC
- Demonstrating safety and health conscious conduct

3.3 Pre-Emergency Preparation

Before the start of field activities, the FC will ensure that preparation has been made in anticipation of emergencies. Preparatory actions include the following:

- All field personnel meeting with the FC concerning the emergency procedures in the event that a person is injured. Appropriate actions for specific scenarios will be reviewed. These scenarios will be discussed and responses determined before the sampling event commences.
- A training session given by the FC informing all field personnel of emergency procedures, locations of emergency equipment and their use, and proper evacuation procedures.
- A training session given by senior staff operating field equipment, to apprise field personnel of operating procedures and specific risks associated with that equipment.
- Ensuring that field personnel are aware of the existence of the emergency response plan, its location, and ensuring that a copy of the HASP accompanies the field team(s).

3.4 Project Emergency Coordinator

The FC will serve as the project emergency coordinator (PEC) in the event of an emergency. The FC will designate a replacement for times when he is not onboard or is not serving as the PEC. The designation will be noted in the logbook. The PEC will be notified immediately when an emergency is recognized. The PEC will be responsible for evaluating the emergency, notifying the appropriate emergency response units, coordinating access with those units, and directing interim actions onboard before the arrival of emergency response units. The PEC will notify the SSHO and the PM as soon as possible after initiating an emergency response action. The PM will have responsibility for notifying the client.

3.5 Emergency Response Contacts

All personnel must know whom to notify in the event of an emergency, even though the FC has primary responsibility for notification. Table 1 lists the names and phone numbers for emergency response services and individuals.

Table 1
Emergency Response Contacts

Emergency Phone Numbers		
Ambulance	911	
Fire	911	
Police	911	
Poison Control	1-800-222-1212	
Project Manager	Mark Larsen	Office: 206-287-9130 Cell: (b) (6)
Field Coordinator	Nathan Soccorsy	Office: 206-287-9130 Cell: (b) (6)
Site Safety and Health Officer	Nathan Soccorsy	Office: 206-287-9130 Cell: (b) (6)
National Response Center	1-800-424-8802	
State Emergency Response System	911	
EPA Environmental Response Team	1-201-321-6600	

Notes:
In the event of any emergency, the PM, FC, SSHO, or any field personnel may contact emergency responders listed in this table.

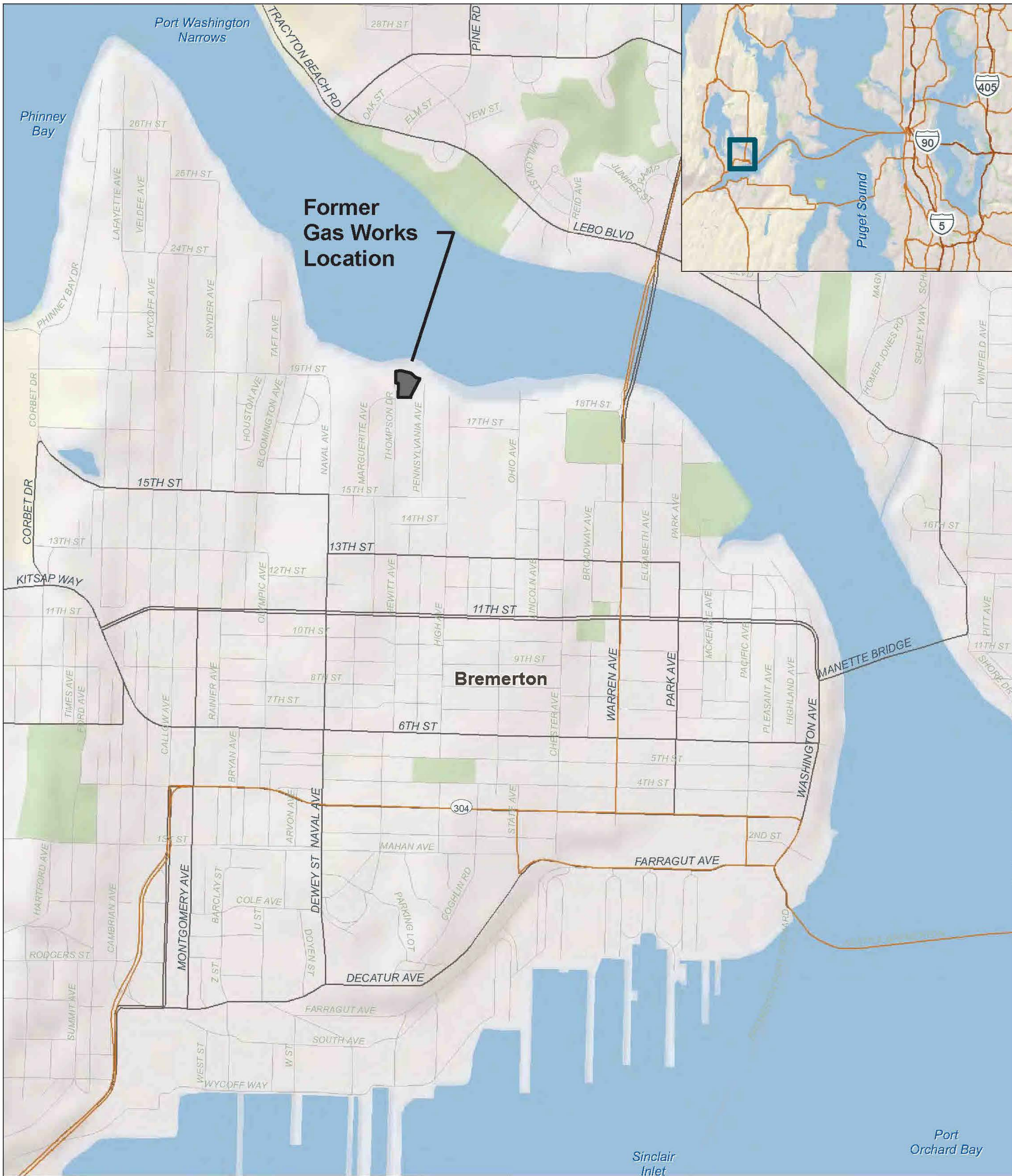
3.6 Emergency Response and Alerting Procedures

Each field team will carry a cell phone and an air horn that are in good working order. Cell phone coverage is good at the Site. Site communications will be done with either a cell phone or the air horn. If there is any type of emergency that requires Site evacuation (for example, a severe thunderstorm), the FC or any other site personnel recognizing the condition will blow the air horn three times. When the horn sounds, all personnel will meet at the end of Pennsylvania Avenue (Figure 1). All other emergency notifications that do not require evacuation will be conducted using a cell phone. Emergency phone numbers are listed in Table 1.

In the event of an emergency, immediate action must be taken by the first person to recognize the event. The following steps will be used as a guideline:

- Survey the situation to ensure that it is safe for you and the victim. Do not endanger your own life. Do not enter an area to rescue someone who has been overcome unless properly equipped and trained. Ensure that all protocols are followed. If applicable, review Material Safety Data Sheets (MSDS) to evaluate response actions for chemical exposures.
- Call the appropriate emergency number (**911**) or direct someone else to do this immediately (see Section 3.1). Explain the physical injury, chemical exposure, fire, or release and location of the incident.
- Have someone retrieve the nearest first aid kit.
- Decontaminate the victim without delaying life-saving procedures (see Section 3.8).
- Administer first aid and CPR, if properly trained, until emergency responders arrive.

- Notify the PM and the FC.
- Complete the appropriate incident investigation reports.



Former Gas Works Location and Vicinity

Bremerton Gasworks
Bremerton, Washington

0 750 1,500
Feet
1:18,000

NOTE:
If a paper copy is required, this figure is best printed in color.

Aspect CONSULTING | ANCHOR QEA | FIRM: ANCHOR QEA DRAWN BY: ckiblinger | FIGURE NO. 1

3.7 Recognition and Prevention of Emergency Situations

Everyone on-site is responsible to monitor the environment for conditions that could lead to a release or an injury. Emergencies will generally be recognizable by observation. The Site team must take steps needed to respond to such observations. An injury or illness will be considered an emergency if it requires treatment by a medical professional and cannot be treated with simple first-aid techniques.

3.8 Decontamination

In the case of evacuation, decontamination procedures will be performed only if doing so does not further jeopardize the welfare of site workers. If an injured individual is also heavily contaminated and must be transported by emergency vehicle, the emergency response team will be told of the type of contamination. To the extent possible, contaminated PPE will be removed, but only if doing so does not exacerbate the injury. Plastic sheeting will be used to reduce the potential for spreading contamination to the inside of the emergency vehicle.

3.9 Fire

Personnel will attempt to control only small fires, should they occur. If an explosion appears likely, personnel will follow evacuation procedures specified by the FC in the training session. If a fire cannot be controlled with a fire extinguisher that is part of the required safety equipment, personnel will either withdraw from the vicinity of the fire or use additional firefighting equipment, or evacuate the upland area as specified by the FC in the training session.

3.10 Personal Injury

In the event of serious personal injury, including unconsciousness, possibility of broken bones, severe bleeding or blood loss, burns, shock, or trauma, the first responder will immediately do the following:

- Administer first aid, if qualified.
- If not qualified, seek out an individual who is qualified to administer first aid, if time and conditions permit.
- Notify the PEC of the incident, the name of the individual, the location, and the nature of the injury.

The PEC will immediately do the following:

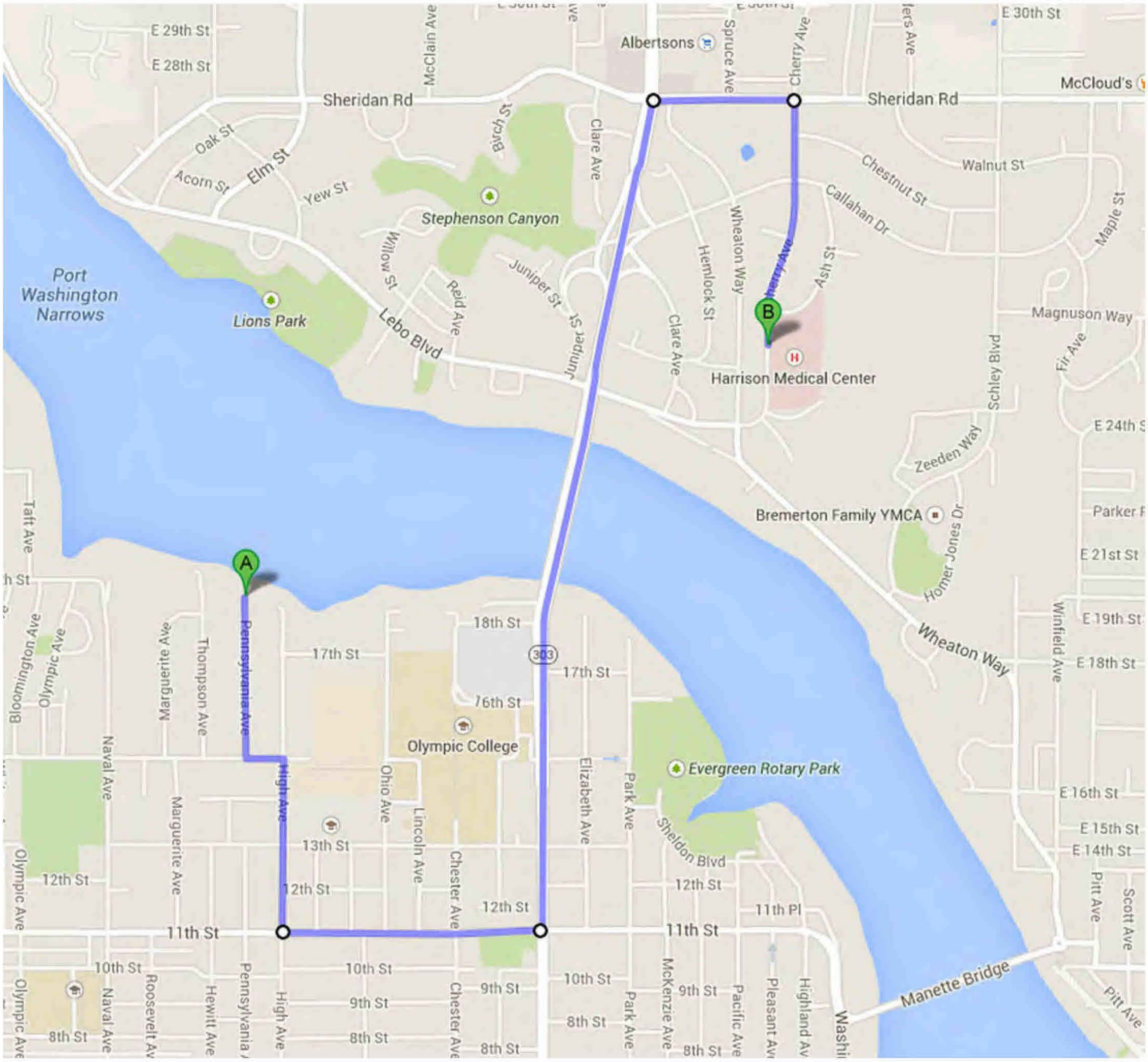
- Notify the appropriate emergency response organization.
- Assist the injured individual.

- Follow the emergency procedures for retrieving or disposing equipment reviewed in the training session, and leave the Site en route to the predetermined land-based emergency pick-up.
- Designate someone to accompany the injured individual to the hospital.
- If an emergency (for example, broken bones or injury where death is imminent without immediate treatment) occurs, the FC will call 911 and arrange to meet the response unit at the nearest accessible dock.
- Notify the SSHO and the PM.

If the PEC determines that emergency response is not necessary, he may direct someone to decontaminate and transport the individual by vehicle to the nearest hospital. Directions and a map showing the route to the hospital are on Figure 2.

If a worker leaves the Site to seek medical attention, another worker should accompany him or her to the hospital. When in doubt about the severity of an injury or exposure, always seek medical attention as a conservative approach and notify the PEC.

The PEC will have responsibility for completing all accident/incident field reports, OSHA form 200s, and other required follow-up forms.



Directions from Site (A) to hospital (B):
1. Head south on Pennsylvania Ave toward 15th Street.
2. Turn left at 15th Street.
3. Take the first right onto High Avenue.
4. Take the third left onto 11th Street.
5. Turn left at Warren Avenue.
6. Continue onto Warren Avenue Bridge.
7. Turn right at Sheridan Road.
8. Take the second right onto Cherry Avenue. Destination will be on the left.

Harrison Bremerton Medical Center
2520 Cherry Avenue
Bremerton, WA 98310
360-744-3911

Map to the Nearest Hospital

Health and Safety Plan
Former Bremerton MGP Site

Aspect CONSULTING | ANCHOR QEA | FIRM: ANCHOR QEA; DRAWN BY: ckiblinger | FIGURE NO. 2

3.11 Overt Personal Exposure or Injury

If an overt exposure to toxic materials occurs, the first responder to the victim will initiate actions to address the situation. The following actions should be taken, depending on the type of exposure:

- Skin Contact:
    - Wash/rinse the affected area thoroughly with copious amounts of soap and water.
    - If eye contact has occurred, eyes should be rinsed for at least 15 minutes using the eyewash that is part of the emergency equipment onboard and in the lab.
    - After initial response actions have been taken, seek appropriate medical attention.
- Inhalation:
    - Move victim to fresh air.
    - Seek appropriate medical attention.
- Ingestion:
    - Seek appropriate medical attention.
    - Puncture Wound or Laceration:
    - Seek appropriate medical attention.

3.12 Spills and Spill Containment

As necessary, spill control measures will be used to contain contaminated materials that may enter into clean areas. Plastic sheeting, sorbent pads, sorbent booms, or a spill control system will be used to prevent spills and contain contaminated material.

If a spill occurs, the SSHO will immediately discuss the event with the U.S. Coast Guard (USCG), EPA, or their oversight contractor to evaluate the need for reporting. Any spill will be reported consistent with state and federal law. In the case of a reportable spill, the National Response Center (800-424-8802) and the Washington State Emergency Response System (911) will be notified by the SSHO or the PM.

4 Hazard Evaluation and Control Measures

This section covers potential chemical and physical hazards that may be associated with the proposed field activities and presents control measures to address these potential hazards. Section 4.4 presents the activity hazard analysis, which lists the potential hazards associated with each site activity and the recommended site control to be used to minimize each potential hazard.

4.1 Exposure Routes

Potential routes of exposure to chemicals include inhalation, dermal contact, and ingestion of dust, mist, gas, vapor, or liquid. Exposure will be minimized by using safe work practices and by wearing the appropriate PPE. Further discussion of PPE requirements is presented in Section 7.

4.1.1 Inhalation

Inhalation of particulates, dust, mist, gas, or vapor during the planned activities is possible. Whenever possible, the work activity will be oriented so that personnel are upwind of the location. An organic vapor monitor (OVM), a photoionization detector (PID), or flame ionization detector (FID) will be used to monitor ambient air in the breathing zone within the work area for organic compounds. Table 2 describes air monitoring action levels and response procedures. A daily air monitoring log form is presented in Attachment 1.

Table 2
Air Monitoring Action Levels

Instrument	Job Tasks/Functions	Measurement	Monitoring Schedule [1]	Actions [2]
OVM, FID, and/or PID (11.7*eV lamp) - Measures Total Organic Vapors	Conduct continuous air monitoring for volatile organic compounds during activities where contaminated media are present. Make sure that a background reading is taken before the start up of activities and periodically thereafter.	Sustained (for 2 minutes) 0 to 5 ppm above background in breathing zone	Continuous (logging periodically every 15 to 30 minutes)	Continue work
		Sustained (for 2 minutes) greater than 5 ppm above background	Continuous (logging periodically every 15 minutes)	Stop work if sustained readings for longer than 2 minutes.[3] Institute engineering controls. If concentrations decrease to below 1 ppm above background, continue work. If concentrations above 5 ppm persist, stop work and contact the project manager (PM) for further instructions.

Notes:
ppm parts per million
Instruments must be calibrated according to manufacturer's recommendations.
1 Monitoring frequency is at beginning of each task and continuously thereafter (logging periodically every 15 minutes), or when detectable sediment contamination is encountered (as indicated by strong, sustained odor, visual evidence of product or petroleum discolored soils). Air monitoring frequency may be changed based on obtained air data for a work task.
2 For VOCs, sustained reading for greater than 2 minutes in excess of the action level will trigger a protective measure.
3 Contact with the PM must be made prior to continuing work. A hazard review must be conducted before proceeding with work.

4.1.2 Dermal Contact

Dermal contact with potentially contaminated soil, sediment, or water operations is possible. Direct contact will be minimized by using appropriate PPE and decontamination procedures.

4.1.3 Ingestion

Ingestion of contaminants is a less likely route of exposure than inhalation or dermal contact for many of the contaminants of concern. Direct ingestion of contaminants can occur by inhaling airborne dust, mist, or vapors or swallowing contaminants trapped in the upper respiratory tract. Indirect ingestion can occur by introducing the contaminants into the mouth by way of food, tobacco, fingers, or other carriers. Although ingestion of contaminants can occur, proper decontamination/contamination reduction procedures should eliminate the probability of this route of exposure.

4.2 Chemical Hazards

Metals, volatile organic compounds (VOCs), petroleum hydrocarbons, PAHs, and free product (that is, coal tar) typically sourced from MGP activities may be present in sediments at the Site. In addition, there is some potential for exposure to hexane, acetone, or non-phosphate soap (that is, Alconox), which in some cases may be used as a decontamination materials. MSDSs for potential chemical hazards are included in Attachment 2.

4.2.1 Volatile Organic Compounds

Based on previous experience at MGP sites, VOCs possibly present at the Site include volatile components of gasoline [benzene, toluene, ethylbenzene, and xylenes (BTEX)]. The primary exposure routes for VOCs during the planned activities are inhalation, dermal contact, and ingestion of contaminated soil, sediment, dust, or water. VOCs readily volatilize and are primarily an inhalation concern. BTEX compounds are known or suspected human carcinogens. MSDSs for BTEX are included in Attachment 2.

An OVM will be used to monitor ambient air and the breathing zone for VOCs. Respiratory protection will be employed if elevated levels of organic compounds are measured by the OVM, if odors are present, or other conditions warrant its use. Air monitoring action levels are presented in Table 2.

4.2.2 Metals

The primary exposure routes for metals potentially during the planned activities are inhalation or ingestion of dust particles. Metals may also be indirectly ingested, as described in Section 4.1.3. A secondary route of exposure to metals is dermal contact. The target organs primarily affected by prolonged exposure to metals are the respiratory tract, gastrointestinal tract, central nervous system, kidneys, and liver.

Prolonged exposure to metals through any of the potential routes of exposure is not expected. Skin will be washed immediately when exposed to soil, sediment, dust, or water potentially impacted by metals.

4.2.3 Total Petroleum Hydrocarbons

Total petroleum hydrocarbons (TPHs) possibly at the Site include tar and oil related materials in sediments and soils, which contain benzene and aromatic hydrocarbons. Gasoline, diesel, fuel, and waste oil, and heavier hydrocarbons such as grease may also be present associated with sampling equipment. The primary exposure routes for petroleum hydrocarbons during the planned activities are inhalation, dermal contact, and ingestion of contaminated soil, sediment, dust, or water. Lighter petroleum hydrocarbons such as gasoline and benzene readily volatilize and are primarily an inhalation concern (as described in Section 4.2.1), whereas the primary route of exposure to heavier petroleum hydrocarbons such as aromatic hydrocarbons, oil, and grease is dermal contact. The target organs primarily affected by prolonged exposure to petroleum hydrocarbons are the respiratory system, central nervous system, kidneys, liver, and skin. Prolonged dermal contact with petroleum hydrocarbons can cause irritation or dermatitis. MSDSs for TPH are included in Attachment 2.

As described in Section 4.2.1, an OVM will be used to monitor ambient air and the breathing zone for TPH compounds that have volatized. Respiratory protection will be employed if elevated levels of organic compounds are measured by the OVM, if odors are present, or other conditions warrant its use. Air monitoring action levels are presented in Table 2.

Petroleum hydrocarbons such as gasoline are also flammable and can be a physical hazard when present in high concentrations. Physical hazards associated with flammable compounds are addressed in Section 4.3.10. Combustion of petroleum hydrocarbons can produce carbon dioxide, carbon monoxide, aldehydes, fumes, smoke (particulate matter), and other products of incomplete combustion. Intentional and inadvertent combustion of petroleum hydrocarbons is not expected during sampling activities; however, personnel will be removed from the area should a fire occur.

4.2.4 Polycyclic Aromatic Hydrocarbons

PAHs are petroleum hydrocarbons which are relatively nonvolatile due to their complex molecular structure and high molecular weight. Consequently, the primary route of exposure to PAHs is through dermal contact. PAHs may also be indirectly ingested, as described in Section 4.1.3. Inhalation of PAHs is unlikely due to their nonvolatile nature. Dermal or eye contact with PAHs can cause irritation or burning. MSDSs for PAHs are included in Attachment 2.

4.2.5 Hydrogen Sulfide

Hydrogen sulfide is a naturally occurring gas often associated with organic clay and peat. Hydrogen sulfide gas is potentially toxic through inhalation, ingestion, and contact with the skin and eyes. Inhalation can result in respiratory irritation, rhinitis, and edema of the lungs. Inhalation of hydrogen sulfide gas can result in headache, dizziness, and agitation. Acute exposure at high concentrations may result in coma and death because of respiratory failure. Hydrogen sulfide gas has a distinct rotten egg odor and, although not expected, will be noted if encountered in the field. MSDSs for hydrogen sulfide are included in Attachment 2.

4.3 Physical Hazards

4.3.1 Slips, Trips, and Falls

As with all fieldwork sites, personnel should exercise caution to prevent slips on slick surfaces. In particular, sampling near or conducting construction observation activities around excavations require careful attention to minimize the risk of falling down. The same care should be used in rainy conditions. Wearing boots with good tread, made of material that does not become overly slippery when wet, can minimize slips.

Trips are always a hazard on t uneven surfaces or in a cluttered work area. Personnel will keep work areas as free as possible from items that interfere with walking and movement. See Section 4.3.5 for more details on uneven surfaces.

Falls may be avoided by working as far away from exposed edges as possible. For this project, the potential for falling is associated primarily with sediment sampling activities and construction management. Personnel will keep walkways and work areas clear when possible and use caution when walking along the shoreline and the riverbank slope.

4.3.2 Fatigue

Since personnel may be working during both daytime and nighttime hours (depending on the activity) 5 to 7 days a week, it is important that all personnel are aware of the hazards related to fatigue. Fatigue can occur at any time when working and may cause safety concerns due to decreased manual dexterity, reaction time, and alertness. The following section is provided to help, prevent, detect, and address fatigue-related issues.

Fatigue can be defined as an increasing difficulty in performing physical or mental activities. Signs of fatigue may include tiredness, changes in behavior, loss of energy, and the reduced ability to concentrate. Fatigued workers may have a reduced ability to recognize or avoid risks on the work site, which may lead to an increase in the number and severity of injuries and other incidents.

Fatigue results from insufficient rest and sleep between activities. Contributing factors to fatigue may include:

- The time of day that work takes place
- The length of time spent at work and in work-related duties
- The type and duration of a work task and the environment (such as, weather conditions and ambient noise) in which it is performed

- The quantity and quality of rest obtained prior to, during, and after a work period
- Non-work activities
- Individual factors such as sleeping disorders, medications, or emotional state

Personnel suffering from fatigue may exhibit both physical and mental effects, such as:

- Slower movements
- Poor coordination
- Slower response time to interaction
- Bloodshot eyes
- Slumped or weary appearance
- Nodding off
- Distractedness or poor concentration
- Inability to complete tasks
- Fixed gaze
- Appearing depressed, irritable, frustrated, or disinterested

Fatigue may cause an increased risk of incidents due to tiredness and lack of alertness. When workers are fatigued, they may be more likely to exercise poor judgment and have slower reactions to external and internal stimuli. This may increase all risks on site because fatigued workers may be less able or likely to respond effectively to changing circumstances, leading to an increased likelihood of incidents due to human error.

To stress the importance of managing fatigue, this topic will be covered in pre-work meetings and will include a discussion of what fatigue is, why it is hazardous, signs and symptoms, and ways to control or mitigate it. Employees will be strongly encouraged to get sufficient pre-work rest, to maintain sufficient nutritional intake during work (that is, eat and drink at regular intervals), and to communicate with team members and leaders if their level of fatigue elevates.

Fatigue management can usually be assisted through the performance of a routine exercise program and an established regular sleep schedule. Workers will be informed that the occurrence of a good night's sleep can be enhanced by avoiding heavy meals or caffeine and minimizing or eliminating the consumption of alcohol and nicotine.

Workers will be periodically observed and directly queried for signs or symptoms of fatigue. Workers that express concern over their level of fatigue, or are observed to be fatigued such that elevated worker risk is evident, will be relieved or their work tasks adjusted so that they may rest sufficiently.

Consistent with applicable labor laws, individuals will not be scheduled to work more than 16 hours (including travel time) in any 24-hour period. Work schedules will consider fatigue factors and optimize continuous periods available for uninterrupted sleep. The employee is responsible for reporting to work properly rested and fit for duty. All personnel will be scheduled to receive a minimum of 8 hours of rest (that is, no work-

related tasks) in any
24-hour period. In case of an emergency or operational difficulties (for example, access due to water levels), work hours may require adjustment, with worker consent.

4.3.3 Marine Sampling Equipment

Marine sampling will include the following equipment:

- Towed-camera video surveys
- Surface sediment sampling using a hydraulic Van Veen grab sampler
- Subsurface sediment sampling using a vibracore
- Water sampling using a Van Dorn, or equivalent, sampler
- In situ water quality monitoring using a multi-parameter sonde
- Shellfish sampling conducted on beaches using hand tools
- Tidal currents evaluation using acoustic doppler

Prior to initiation of sampling, there will be a training session for all field personnel pertaining to the equipment that will be used.

4.3.4 Precautions When Working Around Heavy Equipment

The following precautions will be taken to minimize heavy equipment hazards:

- All equipment must have back-up alarms.
- Personnel must make eye contact with the operator before approaching the equipment and remain safely outside the swing radius of the equipment.
- Personnel must wear orange visibility vests in addition to standard Level D or modified Level D PPE.
- Personnel must never stand on track-hoe tracks to communicate with the operator.
- Operators must be aware of personnel in the area and use proper hand signals before maneuvering.
- Operators must wear hard hats when operating machines and when going to and from their equipment.
- Operators must use spotters and be cautious when maneuvering equipment within 15 feet of overhead power lines and utility pole guy wires, and maintain safe distances at all times (greater than 10 feet).
- Provisions will be made to prevent the unauthorized start-up of equipment when personnel leave the Site at the end of the shift, such as battery ignition locks.

4.3.5 Uneven Work Surfaces

Slips and trips on uneven surfaces such as an excavation edge or beach slope can be particularly hazardous. Care will be taken when setting up equipment near excavations or along the shore to provide an area for field personnel working on or near the equipment. Wearing boots with good tread that are made of material that does not become overly slippery when wet can minimize slips. Sturdy work gloves shall be worn to protect the hands against sharp or rough rocky surfaces.

4.3.6 Manual Lifting and Material Handling

Equipment and samples must be lifted and carried along the shoreline. Back strain can result if lifting is done improperly. During any manual handling tasks, personnel should lift with the load supported by their legs and not their backs. For heavy loads, an adequate number of people will be used, or if possible, a mechanical lifting/handling device. Leather gloves will be worn when handling metal, wire rope, sharp debris, or transporting material (for example, wood, piping, or drums).

4.3.7 Heat Stress

Scheduled sampling operations will be occurring in late fall, and the potential for high temperatures exists. The potential for heat stress may occur if impermeable PPE is worn or if strenuous work is performed under hot conditions with inadequate water. When the core body temperature rises above 100.4 degrees Fahrenheit (° F), the body cannot sweat to cool down, and heat stress can occur. Heat stress may be identified by the following symptoms: dizziness, profuse sweating, skin color change, vision problems, confusion, nausea, fatigue, fainting, and clammy skin. Personnel exhibiting such symptoms will be removed to a cool shady area, given water, and allowed to rest. Fresh drinking water will be provided during field activities. All field team members will monitor their own condition and that of their co-workers to detect signs of heat stress.

4.3.8 Hypothermia

Since work will be conducted in the late fall, cold temperatures and hypothermia are also a possibility. Hypothermia is abnormal lowering of the core body temperature caused by exposure to a cold environment. Wind chill as well as wetness or water immersion can play a significant role. Typical signs of hypothermia include fatigue, weakness, lack of coordination, apathy, and drowsiness. Confusion is a key symptom of hypothermia. Shivering and pallor are usually absent, and the face may appear puffy and pink.

Body temperatures below 90° F require immediate treatment to restore the temperature to normal. Current medical practice recommends slow warming of the individual followed by professional medical care. Moving the person to a sheltered area and wrapping them in a blanket can accomplish this portion of the task. If possible, the person should be placed in a warm room. In emergencies where body temperature falls below 90° F and shelter is not available, a sleeping bag, blankets, and body heat from another individual can be used to help raise body temperature.

4.3.9 Weather

In general, field team members will be equipped for the normal range of weather conditions. The designated FC will be aware of current weather conditions and of the potential for those conditions to pose a hazard to the field personnel. Some conditions that might force work stoppage are electrical storms, high winds, or high waves resulting from winds.

4.3.10 Flammable Hazards

Petroleum hydrocarbons are flammable in moderate to high concentrations; therefore, smoking, open flames, and unprotected ignition sources will not be allowed in the work area. An OVM will be used to measure concentrations of organic vapors in the work area. If elevated OVM measurements persist, work will be suspended until corrective measures are taken to ensure a safe work environment. Table 2 includes additional information about air monitoring action levels.

4.3.11 Biological Hazards

Direct contact with Dyes Inlet water may be hazardous due to the potential for combined sewer overflow (CSO) contamination. All field personnel will avoid contact with potential biological or infectious materials, wear PPE as appropriate, and wash hands and face as soon as possible after contact and before eating or drinking.

4.4 Job Safety Analysis

The job safety analysis (JSA) summarizes the field activities, outlines the hazards associated with each activity, and presents controls that can reduce or eliminate the risk of the hazard occurring. Details regarding specific hazards associated with marine sampling are provided in Attachment 3. The following JSAs are included:

- Boating Activities
- Sediment Sampling
- Water Sampling
- Beach Sampling
- Motor Vehicle Operation

5 Work Zones and Access Control

The FC will delineate the boundaries of the work zones and will inform the field personnel of the arrangement. The purpose of the zones is to limit the migration of sample material out of the zones and to restrict access to active work areas by defining work zone boundaries.

5.1 Sampling Work Zones

The following zones are sampling work zones:

- **Exclusion zone:** The exclusion zone will enclose the entire perimeter of the sampling location/machinery and will include the area where sampling is taking place. The exclusion zone will encompass an area 1.5-times the height of the drill rig tower around the drill rig where practical. Where topography and structures preclude this area, adjustments will be made in the field. Only sampling personnel may enter this zone unless assistance is required by other personnel. The exclusion zone will also include a nearby sample processing area along the shoreline or on top of the bank area. Samples will likely be processed under fold-up canopies and the exclusion zone will encompass the entire area under the canopy where samples will be processed or where contact to contaminated soil and sediments is possible. Entry and exit to this zone will be through a designated access point.
- **Contamination reduction zone (CRZ):** The CRZ during sediment handling will encompass the area surrounding the Exclusion zone. Decontamination of both personnel and equipment will occur in this zone to prevent the transfer of chemicals of concern to the support zone. Entry and exit between zones will be through a designated access point.
- **Support zone:** The support zone will be located in the on-site trailer or outside the CRZ.

Sampling staff will instruct people to stay outside the exclusion zone where samples are collected and where sample processing is occurring.

5.2 Decontamination Area

All contaminated materials will be properly contained. A station within the CRZ will be set up for decontaminating sample processing equipment and personnel gear such as boots or PPE. The station will have the buckets, brushes, soapy water, rinse water, or wipes necessary to perform decontamination operations. Plastic bags will be provided for expendable and disposable materials. The decontamination fluids will be stored in sealable containers and will be disposed of in accordance with applicable regulations.

5.3 Access Control

Security and control of access to the Site will be the responsibility of the site supervisor (SS) and/or SSHO. Access to the work areas will only be granted to necessary project personnel and authorized visitors. Any security or access control problems will be reported to the client or appropriate authorities.

6 Safe Work Practices

Following common sense rules will minimize the risk of exposure or accidents at a work site. These general safety rules will be followed on site:

- Always use the buddy system.
- Be aware of overhead and underfoot hazards at all times.
- Do not eat, drink, smoke, or perform other hand-to-mouth transfers in the work zones.
- Get immediate first aid for all cuts, scratches, abrasions, or other minor injuries.
- Report all accidents and near-misses, no matter how minor, to the FC.
- Be alert to your own and other workers' physical condition.
- Do not climb over or under obstacles of questionable stability.
- Make eye contact with equipment operators before moving into the range of their equipment.
- Work during daylight hours.

7 Personal Protective Equipment and Safety Equipment

Appropriate PPE will be worn for all tasks as protection against potential hazards. Prior to donning PPE, the workers will inspect their equipment for any defects that might render the equipment ineffective.

All fieldwork for all tasks will be conducted in Level D or modified Level D as discussed in Sections 6.1, 6.2, and 6.3. Situations requiring PPE beyond modified Level D are not anticipated for this project. Should the FC determine that PPE beyond modified Level D is necessary at a given sampling station, the FC will notify the SSHO to select an appropriate corrective action.

7.1 Level D Personal Protective Equipment

Workers performing general activities in which skin contact with contaminated materials is unlikely and in which inhalation risks are not expected will wear Level D PPE. Level D PPE includes the following:

- Chemical-resistant, steel-toed boots
- Leather, cotton, or chemical-resistant gloves, as the type of work requires
- Safety glasses
- Hard hat (if overhead hazard exists)
- Hearing protection, if necessary

7.2 Modified Level D Personal Protective Equipment

Workers performing activities where skin contact with contaminated materials is possible will wear chemical-resistant outer gloves and an impermeable outer suit. The type of outerwear will be chosen according to the types of chemical contaminants that might be encountered. Modified Level D PPE includes the following:

- Outer garb such as rain gear or rubber or vinyl aprons
- Chemical-resistant steel-toed boots
- Surgical rubber inner gloves
- Chemical-resistant outer gloves
- Safety glasses (or face shield, if significant splash hazard exists)
- Hard hat (if overhead hazard exists)
- Hearing protection, if necessary

7.3 Safety Equipment

In addition to PPE that will be worn by personnel, basic emergency and first aid equipment will also be provided and easily accessible in an unlocked location known to all personnel prior to the start of any activities. Equipment will include:

- A copy of this HASP
- First aid kit adequate for the number of personnel
- Emergency eyewash

Anchor QEA and/or subcontractors will provide this equipment, which must be at the location(s) where field activities are being performed. Equipment will be checked daily to ensure its readiness for use.

8 Monitoring Procedures for Site Activities

A monitoring program that addresses the potential site hazards will be maintained. The monitoring program includes self-monitoring by the field personnel and monitoring with instruments.

8.1 Self Monitoring

All personnel will be instructed to look for and inform each other of any negative changes in their physical or mental condition during the performance of all field activities. Examples of such changes are as follows:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory system
- Changes in complexion or skin color
- Changes in apparent motor coordination
- Increased frequency of minor mistakes
- Excessive salivation or changes in papillary response
- Changes in speech ability or speech pattern
- Symptoms of heat stress or heat exhaustion (Section 4.3.7)
- Symptoms of hypothermia (Section 4.3.8)

If any of these conditions develop, the affected person(s) will be moved from the immediate work location and evaluated. If further assistance is needed, personnel at the local hospital will be notified, and an ambulance will be summoned if the condition is thought to be serious. If the condition is the result of sample collection or processing activities, procedures and/or PPE will be modified to address the problem.

8.2 Real-time Air Monitoring Equipment

Organic vapor concentrations shall be monitored in the field using an OVM, PID, or FID. During sampling and excavation work, organic vapor measurements shall be taken in the breathing zone of workers while additional area monitoring may be conducted to gather background and environmental impact information.

Other real-time air monitoring equipment may be utilized depending upon the scope of work and compounds of concern. Air monitoring results shall be documented on the air monitoring log form presented in Attachment 1.

The air monitoring scope and frequency may be adjusted based on air data obtained during the initial stages of a work task.

8.2.1 Equipment Calibration and Maintenance

Calibration and maintenance of air monitoring equipment shall follow manufacturer specifications and must be documented. Re-calibration and adjustment of air monitoring equipment shall be completed daily and as site conditions and equipment operation warrant. Records of air monitoring equipment calibration and adjustment information will be recorded in the field logbook or daily log form.

8.2.2 Air Monitoring Action Levels

Air monitoring action levels have been developed for this project and are listed in Table 2.

9 Decontamination

Decontamination is necessary to prevent the migration of contaminants from the work zone(s) into the surrounding environment and to minimize the risk of exposure of personnel to contaminated materials that might adhere to PPE. The following sections discuss personnel and equipment decontamination.

The following supplies will be available to perform decontamination activities:

- Wash and rinse buckets
- Tap water and phosphate-free detergent (such as Alconox)
- Hexane or acetone (or similar type solution) for more robust equipment decontamination
- Scrub brushes and plastic tubs
- Distilled/deionized water
- Paper towels and plastic garbage bags

9.1 Minimization of Contamination

The following measures will be observed to prevent or minimize exposure to potentially contaminated materials:

- Personnel:
  - Do not walk through spilled sediment or soil
  - Do not handle, touch, or smell sediment or soil directly
  - Make sure PPE has no cuts or tears prior to use
  - Protect and cover any skin injuries
  - Stay upwind of airborne dusts and vapors
  - Do not eat, drink, chew tobacco, or smoke in the work zones
- Sampling Equipment and Machinery:
  - Use care to avoid getting sampled media on the outside of sample containers
  - If necessary, bag sample containers before filling with sampled media
  - Place clean equipment on a plastic sheet to avoid direct contact with contaminated media
  - Keep contaminated equipment and tools separate from clean equipment and tools
  - Fill sample containers over a plastic tub to contain spillage

- Clean up spilled material immediately to avoid tracking around the drill rig

9.2 Personal Decontamination

The FC will ensure that all site personnel are familiar with personnel decontamination procedures. Personnel will perform decontamination procedures, as appropriate, when exiting work areas. Following is a description of the decontamination procedure:

- Wash and rinse outer gloves and boots in portable buckets
- If suit is heavily soiled, rinse it off
- Remove outer gloves, inspect and discard if damaged, leave inner gloves on
- Remove inner gloves and wash hands if taking a break
- Don necessary PPE before returning to work
- Dispose of soiled PPE before leaving for the day

10 Training Requirements

Individuals performing work at locations where potentially hazardous materials and conditions may be encountered must meet specific training requirements. It is not anticipated that personnel will encounter hazardous concentrations of contaminants in sampled material, so training will consist of site-specific instruction for all personnel and oversight of inexperienced personnel for one working day. The following sections describe the training requirements for work at this Site.

10.1 Project Specific Training

All Anchor QEA personnel must read this HASP and be familiar with its contents before beginning work. They shall acknowledge reading the HASP by signing the field team HASP review form contained in Attachment 4. The form will be kept in the project files.

The FC or a designee will provide and document project-specific training during the project kickoff meeting and whenever new Anchor QEA workers arrive for fieldwork. Anchor QEA personnel will not be allowed to begin work until project-specific training is completed and documented by the FC. Training will address the HASP and all health and safety issues and procedures pertinent to field operations. Training will include, but will not be limited to, the following topics:

- Activities with the potential for chemical exposure
- Activities that pose physical hazards, and actions to control the hazards
- Site access control and procedures
- Use and limitations of PPE
- Decontamination procedures
- Emergency procedures
- Use and hazards of sampling equipment
- Location of emergency equipment

All workers in the exclusion zone or CRZ must have 40-hour HAZWOPER training in accordance with OSHA. An updated 8-hour HAZWOPER refresher training is required for all workers in the exclusion zone or CRZ whose 40-hour HAZWOPER training certificate is more than one year old.

10.2 Daily Safety Briefings

The FC or a designee will conduct daily safety briefings before the start of each day's activities. These briefings will outline the activities expected for the day, update work practices and hazards, and address any specific concerns associated with the work location, and review emergency procedures and routes. The tailgate safety briefings will be documented in the logbook. A checklist of daily safety briefing topics will be conducted and supplemented with the following topics:

- Hazard Exposure Routes
- Chemical Hazards
- Physical Hazards
- Biological Hazards
- Mitigation Procedures
- Safety Communication
- Lines of Authority
- Description of first aid kit, including a discussion of usage (initial comprehensive training session and a brief daily overview)
- Near-water safety

A daily safety briefing log form is presented in Attachment 1.

11 Recording and Record Keeping

The FC or a designee will record health- and safety-related details of the project in the field logbook. The logbook must be bound and the pages must be numbered consecutively. Entries will be made with indelible ink. At a minimum, each day's entries must include the following information:

- Project name or location
- Names of all personnel
- Level of PPE worn and any other specifics regarding PPE
- Weather conditions
- Type of fieldwork being performed

The person maintaining the entries will initial and date the bottom of each completed page. Blank space at the bottom of an incompletely filled page will be lined out. Each day's entries will begin on the first blank page after the previous workday's entries.

As necessary, other documentation will be obtained or initiated by the FC. Other documentation may include field change requests, medical and training records, exposure records, accident/incident report forms, OSHA Form 200s, and material safety data sheets. Attachment 1 contains copies of key health and safety forms.

12 Health and Safety Plan Approval Record

By their signature, the undersigned certify that this HASP is approved and that it will be used to govern health and safety aspects of fieldwork conducted by Anchor QEA personnel to investigate areas associated within the Site area.

Anchor QEA Project Manager	Date
Anchor QEA Site Supervisor	Date
Anchor QEA Site and Safety Health Officer	Date

13 References

U.S. Environmental Protection Agency (EPA), 2001. Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual. EPA/823/B-01-022, October 2001.

ATTACHMENT 1
HEALTH AND SAFETY LOGS AND FORMS

DATE: ______________________

PROJECT NAME: ______________________

PROJECT NO: ______________________

DAILY SAFETY BRIEFING

PERSON CONDUCTING MEETING: ____________ **HEALTH & SAFETY OFFICER:** ____________ **PROJECT MANAGER:** ____________

TOPICS COVERED:

- ☐ Emergency Procedures and Evacuation Route
- ☐ Directions to Hospital
- ☐ HASP Review and Location
- ☐ Safety Equipment Location
- ☐ Proper Safety Equipment Use
- ☐ Employee Right-to-Know/MSDS Location
- ☐ Fire Extinguisher Location
- ☐ Eye Wash Station Location
- ☐ Buddy System
- ☐ Self and Coworker Monitoring
- ☐ Lines of Authority
- ☐ Communication
- ☐ Site Security
- ☐ Vessel Safety Protocols
- ☐ Work Zones
- ☐ Vehicle Safety and Driving/Road Conditions
- ☐ Equipment Safety and Operation
- ☐ Proper Use of PPE
- ☐ Decontamination Procedures
- ☐ Other:
- ☐ Lifting Techniques
- ☐ Slips, Trips, and Falls
- ☐ Hazard Exposure Routes
- ☐ Heat and Cold Stress
- ☐ Overhead and Underfoot Hazards
- ☐ Chemical Hazards
- ☐ Flammable Hazards
- ☐ Biological Hazards
- ☐ Eating/Drinking/Smoking

WEATHER CONDITIONS: ______________________

DAILY WORK SCOPE: ______________________

SITE-SPECIFIC HAZARDS: ______________________

SAFETY COMMENTS: ______________________

ATTENDEES

PRINTED NAME	SIGNATURE

DAILY AIR MONITORING RECORD

PROJECT NAME: ______________________ **DATE:** ______________________

PROJECT NUMBER: ______________________ **LOCATION:** ______________________

TEMPERATURE: ______________________

CONDITIONS: ______________________

COC	Instrument	S/N	Calibration Date	Calibration Gas/Method	Calibration by
Organic vapors					
Particulates					
O_2					
Other:					
Other:					
Other:	Draeger				

Time	Location/Description	Organic Vapor (ppm)	O_2%	CG %LEL	Other	Other

Notes:

Completed by:

Printed Name ______________________ Signature ______________________ Date ______________________

EMPLOYEE EXPOSURE/INJURY INCIDENT/SPILL REPORT

EMPLOYEE NAME: ______________________ **DATE:** ______________________

PROJECT NAME/NO: ______________________ **TIME:** ______________________

TYPE OF OCCURRENCE: ☐ employee exposure ☐ injury incident ☐ spill

SITE NAME AND LOCATION: ______________________

SITE WEATHER (clear, rain, snow, etc.): ______________________

NATURE OF ILLNESS/INJURY: ______________________

SYMPTOMS: ______________________

ACTION TAKEN: ☐ rest ☐ first aid ☐ medical

TRANSPORTED BY: ______________________

WITNESSED BY: ______________________

HOSPITAL NAME: ______________________ **TREATMENT:** ______________________

DESCRIBE IN DETAIL HOW THIS EXPOSURE/INJURY INCIDENT/SPILL OCCURRED
(if a spill, list the name of the compounds, quantities, and method of clean-up/containment): ______________________

WHAT WAS THE PERSON DOING AT THE TIME OF THE ACCIDENT/INCIDENT?: ______________________

LIST PERSONAL PROTECTIVE EQUIPMENT WORN: ______________________

WHAT IMMEDIATE ACTION WAS TAKEN TO PREVENT RECURRENCE?: ______________________

Employee:

Printed Name	Signature	Date

Supervisor:

Printed Name	Signature	Date

Site Safety Representative:

Printed Name	Signature	Date

NOTE: Use additional page(s) if necessary.

ATTACHMENT 2
MATERIAL SAFETY DATA SHEETS

Conforms to ANSI Z400.5-2004 Standard (United States).

Material Safety Data Sheet

Agilent Technologies

EPA Methods 550/550.1/610 Polynuclear Aromatic Hydrocarbons (PAH) Standard PN: 8500-6035

1. Product and company identification

Product name	: **EPA Methods 550/550.1/610 Polynuclear Aromatic Hydrocarbons (PAH) Standard PN: 8500-6035**
Part No.	: 8500-6035
Manufacturer / Supplier	: Agilent Technologies, Inc. Logistics Center - Americas 500 Ships Landing Way New Castle, Delaware 19720
Emergency telephone number	: 1-302-633-8777 1-877-4 Agilent (Information Telephone Number)
Use of the substance/preparation	: Analytical chemistry. A 1ml. ampoule preparation
Validation date	: 10/27/2009

2. Hazards identification

Physical state : Liquid. [Clear.]

Odor : Ether-like

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview- Signal Word : WARNING !

Emergency overview- Label Statement : FLAMMABLE LIQUID AND VAPOR. HARMFUL IF INHALED. CAUSES EYE IRRITATION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN OR IF SWALLOWED. MAY CAUSE RESPIRATORY TRACT AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

Flammable liquid. Toxic by inhalation. Harmful in contact with skin and if swallowed. Irritating to eyes. Slightly irritating to the skin and respiratory system. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Do not ingest. Do not get in eyes. Avoid contact with skin and clothing. Contains material that may cause target organ damage, based on animal data. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Contains material which may cause damage to the following organs: kidneys, liver, cardiovascular system, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Eyes : Irritating to eyes.

Skin : Harmful in contact with skin. Slightly irritating to the skin.

Inhalation : Toxic by inhalation. Slightly irritating to the respiratory system. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Ingestion : Harmful if swallowed.

Medical conditions aggravated by over-exposure : Repeated skin exposure can produce local skin destruction or dermatitis. Repeated or prolonged exposure to the substance can produce lung damage. Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to the substance can produce target organs damage.

Other adverse effects : Not applicable.

2 . Hazards identification

See toxicological information (section 11)

3 . Composition/information on ingredients

United States

Name	CAS number	%
Acetonitrile	75-05-8	99.2
Pyrene	129-00-0	0.05
Phenanthrene	85-01-8	0.05
Naphthalene	91-20-3	0.05
Indeno[1,2,3-cd]pyrene	193-39-5	0.05
Fluorene	86-73-7	0.05
Fluoranthene	206-44-0	0.05
Dibenz[a,h]anthracene	53-70-3	0.05
Chrysene	218-01-9	0.05
Benzo[k]fluoranthene	207-08-9	0.05
Benzo[ghi]perylene	191-24-2	0.05
Benz[e]acephenanthrylene	205-99-2	0.05
Benzo[a]pyrene	50-32-8	0.05
Benz[a]anthracene	56-55-3	0.05
Anthracene	120-12-7	0.05
Acenaphthylene	208-96-8	0.05
Acenaphthene	83-32-9	0.05

4 . First aid measures

Eye contact : In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if adverse health effects persist or are severe.

Skin contact : In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention if adverse health effects persist or are severe.

Inhalation : If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention if adverse health effects persist or are severe.

Ingestion : Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention if adverse health effects persist or are severe.

Protection of first-aiders : Not applicable.

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

5 . Fire-fighting measures

Flammability of the product : Flammable.

Products of combustion : Decomposition products may include the following materials:
carbon oxides
nitrogen oxides

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards - fire : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special exposure hazards - Explosibility : Flammable liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

5 . Fire-fighting measures

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Container explosion may occur under fire conditions or when heated.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

7 . Handling and storage

Handling : Do not ingest. Avoid contact with eyes, skin and clothing. Keep container closed. Use only with adequate ventilation. Avoid breathing vapor or mist. Keep away from heat, sparks and flame. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Product name	Exposure limits
United States	
Acetonitrile	**ACGIH TLV (United States, 1/2008). Skin** TWA: 20 ppm 8 hour(s). **NIOSH REL (United States, 6/2008).** TWA: 34 mg/m³ 10 hour(s). TWA: 20 ppm 10 hour(s). **OSHA PEL (United States, 11/2006).** TWA: 70 mg/m³ 8 hour(s). TWA: 40 ppm 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** STEL: 105 mg/m³ 15 minute(s). STEL: 60 ppm 15 minute(s). TWA: 70 mg/m³ 8 hour(s). TWA: 40 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

8 . Exposure controls/personal protection

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Chemical resistant protective gloves and clothing are recommended. The choice of protective gloves or clothing must be based on chemical resistance and other use requirements. Generally, BUNA-N offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to this chemical may require additional protective clothing.

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Other protection : Not available.

9 . Physical and chemical properties

Physical state : Liquid. [Clear.]

Flash point : Lowest known value: Closed cup: 5.85°C (42.5°F). (Acetonitrile)

Auto-ignition temperature : Lowest known value: 524°C (975.2°F) (Acetonitrile).

Color : Clear. Colorless.

Odor : Ether-like

Boiling/condensation point : 81.6°C (178.9°F)

Melting/freezing point : -45°C (-49°F)

Vapor pressure : 11.6 kPa (87 mm Hg) (at 20°C)

Vapor density : 1.42 (Air = 1)

Evaporation rate : 5.79

Solubility : Soluble in the following materials: cold water and hot water.

10 . Stability and reactivity

Stability and reactivity : The product is stable. Under normal conditions of storage and use, hazardous polymerization will not occur.

Incompatibility with various substances : Highly reactive or incompatible with the following materials: oxidizing materials, reducing materials, metals, acids, alkalis and moisture.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Conditions of reactivity - Flammability : Highly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.
Container explosion may occur under fire conditions or when heated.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Acetonitrile	LD50 Dermal	Rabbit	980 mg/kg	-
	LD50 Oral	Rat	2460 mg/kg	-
	LC50 Inhalation Gas.	Rat	7551 ppm	8 hours

Eyes : Irritating to eyes.

Skin : Harmful in contact with skin. Slightly irritating to the skin.

Inhalation : Toxic by inhalation. Slightly irritating to the respiratory system. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Ingestion : Harmful if swallowed.

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Ingestion : No specific data.

Skin : Adverse symptoms may include the following:
irritation
redness

Eyes : Adverse symptoms may include the following:
pain or irritation
watering
redness

Target organs : Contains material which may cause damage to the following organs: kidneys, liver, cardiovascular system, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

Other adverse effects : Not available.

12 . Ecological information

Environmental effects : This product shows a low bioaccumulation potential.

Aquatic ecotoxicity

Product/ingredient name	Test	Result	Species	Exposure
Acetonitrile	-	Acute LC50 3600000 ug/L Fresh water	Daphnia	48 hours
	-	Acute LC50 >100000 ug/L Fresh water	Fish	96 hours

Octanol/water partition coefficient : -0.34

Toxicity of the products of biodegradation : The products of degradation are less toxic than the product itself.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

RCRA classification : **Code:** U003

Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

The information presented below only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Class	PG*	Label	Additional information
DOT Classification	UN1648	Acetonitrile	3	II		**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 5 L Packaging instructions: 173.161 **Cargo aircraft** Quantity limitation: 60 L **Special provisions** IB2, T7, TP2 **Remarks** Small Quantity
TDG Classification	UN1648	ACETONITRILE	3	II		**Explosive Limit and Limited Quantity Index** 1 **Passenger Carrying Road or Rail Index** 5
IMDG Class	UN1648	ACETONITRILE	3	II		**Emergency schedules (EmS)** F-E, S-D

14 . Transport information

IATA Class	UN1648	Acetonitrile	3	II		**Passenger and Cargo Aircraft** Quantity limitation: 5 L Packaging instructions: 305 **Cargo Aircraft Only** Quantity limitation: 60 L Packaging instructions: 307 **Limited Quantities - Passenger Aircraft** Quantity limitation: 1 L Packaging instructions: Y305 **Remarks** A44 Excepted Quantity

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Flammable liquid
Toxic material
Irritating material
Target organ effects

Contains material which may cause damage to the following organs: kidneys, liver, cardiovascular system, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

U.S. Federal regulations : TSCA 4(a) final test rules: Acetonitrile; Naphthalene
TSCA 8(a) CAIR: Pyrene; Phenanthrene
TSCA 8(a) PAIR: Acetonitrile; Naphthalene
United States inventory (TSCA 8b): Not determined.
TSCA 12(b) one-time export: Acetonitrile; Naphthalene

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Acetonitrile
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Acetonitrile: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 307: Acetonitrile; Pyrene; Phenanthrene; Naphthalene; Indeno[1,2,3-cd]pyrene; Fluorene; Fluoranthene; Dibenz[a,h]anthracene; Chrysene; Benzo[k]fluoranthene; Benzo[ghi]perylene; Benz[e]acephenanthrylene; Benzo[a]pyrene; Benz[a]anthracene; Anthracene; Acenaphthylene; Acenaphthene

Clean Water Act (CWA) 311: Naphthalene

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

SARA 313

	Product name	CAS number	Concentration
Form R - Reporting requirements :	Acetonitrile	75-05-8	99.2
Supplier notification :	Acetonitrile	75-05-8	99.2

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

15 . Regulatory information

State regulations : **Connecticut Carcinogen Reporting**: None of the components are listed.
Connecticut Hazardous Material Survey: None of the components are listed.
Florida substances: None of the components are listed.
Illinois Chemical Safety Act: None of the components are listed.
Illinois Toxic Substances Disclosure to Employee Act: None of the components are listed.
Louisiana Reporting: None of the components are listed.
Louisiana Spill: None of the components are listed.
Massachusetts Spill: None of the components are listed.
Massachusetts Substances: The following components are listed: ACETONITRILE
Michigan Critical Material: None of the components are listed.
Minnesota Hazardous Substances: None of the components are listed.
New Jersey Hazardous Substances: The following components are listed: ACETONITRILE
New Jersey Spill: None of the components are listed.
New Jersey Toxic Catastrophe Prevention Act: None of the components are listed.
New York Acutely Hazardous Substances: The following components are listed: Acetonitrile
New York Toxic Chemical Release Reporting: None of the components are listed.
Pennsylvania RTK Hazardous Substances: The following components are listed: ACETONITRILE
Rhode Island Hazardous Substances: None of the components are listed.

State regulations - California Prop. 65 : **WARNING:** This product contains a chemical known to the State of California to cause cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Pyrene	Yes.	No.	No.	No.
Phenanthrene	Yes.	No.	No.	No.
Naphthalene	Yes.	No.	Yes.	No.
Indeno[1,2,3-cd]pyrene	Yes.	No.	No.	No.
Fluoranthene	Yes.	No.	No.	No.
Dibenz[a,h]anthracene	Yes.	No.	Yes.	No.
Chrysene	Yes.	No.	0.35 µg/day (ingestion)	No.
Benzo[k]fluoranthene	Yes.	No.	No.	No.
Benzo[ghi]perylene	Yes.	No.	No.	No.
Benz[e]acephenanthrylene	Yes.	No.	0.096 µg/day (ingestion)	No.
Benzo[a]pyrene	Yes.	No.	Yes.	No.
Benz[a]anthracene	Yes.	No.	0.033 µg/day (ingestion)	No.
Anthracene	Yes.	No.	No.	No.
Acenaphthylene	Yes.	No.	No.	No.

16 . Other information

Label requirements : FLAMMABLE LIQUID AND VAPOR. HARMFUL IF INHALED. CAUSES EYE IRRITATION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN OR IF SWALLOWED. MAY CAUSE RESPIRATORY TRACT AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

Date of issue : 10/27/2009

Date of previous issue : 09/28/2005

Version : 2

Notice to reader

16 . Other information

DISCLAIMER: This Material Safety Data Sheet is offered without charge to the clients of Agilent Technologies. Data is the most current available to Agilent Technologies at the time of preparation and is issued as a matter of information only, no warranty as to its accuracy or completeness is expressed or implied.

ATTACHMENT 3
JOB SAFETY ANALYSES

General Boating Activities

Project Name: Bremerton Gas Works RI/FS Marine Sampling	**Project Number:** 131014-01.01	**JSA Number:** 001	**Issue Date:** April 8, 2015
Location: Dyes Inlet, Bremerton, Washington	**Contractor:** Anchor QEA, LLC	**Analysis by:** Tracy Schuh	**Analysis Date:** April 8, 2015
Work Operation: General boating activities	**Superintendent/Competent Person:** Tracy Schuh	**Revised by:** N/A	**Revised Date:** N/A
Required Personal Protective Equipment (PPE): • Modified Level D – Long pants or coveralls, steel-toed footwear conforming to American Society for Testing and Materials (ASTM) F2412-05/ASTM F2413-05, U.S. Coast Guard-approved personal flotation device • Depending on activity, nitrile gloves, safety glasses and hard hat may also be required		**Reviewed by:** Nathan Soccorsy **Approved by:** Nathan Soccorsy	**Reviewed Date:** April 8, 2015 **Approved Date:** April 8, 2015

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Walking on deck	Pinch points	• Secure any unsecured objects on deck; they may shift on deck quickly in wave/current/engine acceleration conditions. • Maintain safe distance from closing mechanisms and moving parts, such as on sampling gear. • Avoid placing hands or self between boat and dock/piles.	

General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Slips, trips, and falls	• Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants/seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet ground. • Jumping, running, and horseplay are prohibited. • Be cautious when entering or exiting the vessel, and load/unload items onto/off of the pier or shore once boarded. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.
Walking on deck (continued)	Exceeding boat capacity	• Keep the number of passengers and equipment as posted on boat placards within limits at all times. If conditions warrant, reduce capacity to maintain boat stability.	• Ensure that field team is aware of limits and adheres accordingly.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery/equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Rain	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions.	• PPE should be inspected daily prior to use. • Routinely inspect work area for deteriorating conditions.

General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors (continued)	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are on board.
	Fog	• Wait for fog to lift for adequate visibility.	
	Lightning	• Do not begin or continue work until lightning subsides for at least 20 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. • If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.
	High river flows or high waves	• Be aware of waves and forecasts and recent rainfall in your watershed.	• Have forecast available.
	High winds	• Wear goggles or safety glasses if dust/debris is visible.	• Ensure that goggles/safety glasses are on board.
Vessel emergencies	Man overboard	• Shout “man overboard,” throw flotation device, keep engine away from person, and call 911 or USCG if needed.	• Ensure that floatation devices are available. • Ensure that team wears PFDs.
Vessel emergencies (continued)	Fire, abandon ship	• Be prepared to abandon ship in case of major fire or other emergency. Only the captain can order abandon ship. • Communicate intent to abandon to all personnel; notify USCG and nearby vessels. • Call 911 when able to do so; notify project safety personnel when time permits.	• Ensure that fire extinguisher is available/current and is in working order. • Review abandon ship procedures with field team prior to work.
Navigation	Boat traffic	• Maintain a safe operating distance from shoreline and other vessels.	• Be aware of on-water surroundings.

General Boating Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Motor vehicle operation and trailering	Boat not secured properly	• Ensure that latches, straps, antennas, and onboard gear are secure. Ensure that motor is up and lights are plugged in for driving. • Follow Job Safety Analysis (JSA) for motor vehicle operation	• Inspect around entire boat before driving.

Training Requirements

- If professional captained vessel is not in use, boat operators must take appropriate state boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Sediment Sampling

Project Name: Bremerton Gas Works RI/FS Marine Sampling	**Project Number:** 131014-01.01	**JSA Number:** 002	**Issue Date:** April 8, 2015
Location: Dyes Inlet, Bremerton, Washington	**Contractor:** Anchor QEA, LLC	**Analysis by:** Tracy Schuh	**Analysis Date:** April 8, 2015
Work Operation: Sediment sampling	**Superintendent/Competent Person:** Tracy Schuh	**Revised by:** N/A	**Revised Date:** N/A
Required Personal Protective Equipment (PPE): • Modified Level D – Long pants or coveralls, steel-toed footwear conforming to American Society for Testing and Materials (ASTM) F2412-05/ASTM F2413-05, nitrile gloves, U.S. Coast Guard-approved personal flotation device, safety glasses • Depending on activity, hard hat may also be required		**Reviewed by:** Nathan Soccorsy **Approved by:** Nathan Soccorsy	**Reviewed Date:** April 8, 2015 **Approved Date:** April 8, 2015

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow Job Safety Analysis (JSA) for boating activities.	
Sediment sample retrieval and processing	Injury from hand and power tool operation (e.g., electric shears or drill)	• Be aware of sharp edges on hand tools (e.g., knives, drill bits, and saw blades). • Be aware of electrical connections and water hazards when working with electric- or battery-operated tools. • Ensure that all tools are working properly; repair or replace defective tools. Repair when unplugged and off. • Keep guards on power tools when not in use.	• Inspect tools to ensure that they're in good working order. • Inspect electrical connections (if applicable). • Inspect tools periodically to ensure dry and clean operation.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery/equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.

Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Sediment sample retrieval and processing (continued)	Slips, trips, and falls	• Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants/seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet ground. • Jumping, running, and horseplay are prohibited. • Be cautious when entering or exiting the vessel, and load/unload items onto/off of the pier or shore once boarded. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.
	Ingestion of contaminants, skin/eye contact with contaminants	• Wear appropriate PPE to prevent/reduce exposure. • Contact 911, as necessary; perform CPR if breathing stops. • Move exposed person away from source of contamination, and rinse mouth. If exposure to skin occurs, promptly wash contaminated skin using soap or mild detergent and water. Rinse eyes with large amounts of water. • Follow decontamination procedures as outlined in the HASP.	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.
	Muscle strain/injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects. • If boating, avoid carrying objects directly onto or off the boat; rather, load/unload objects while on the boat to/from the pier/shore.	• Evaluate weight and center of gravity of heavier items prior to lifting/moving.
	Pinch points	• If boating, secure any unsecured objects on deck; they may shift on deck quickly in wave/current/engine acceleration conditions. • Maintain safe distance from closing mechanisms and moving parts on sampling gear. • Avoid placing hands or self between boat and dock/piles.	

Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
Working outdoors (continued)	Rain	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions.	• PPE should be inspected daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides for 20 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.
	High winds	• Wear goggles or safety glasses if dust/debris is visible.	• Ensure that goggles/safety glasses are available.

Training Requirements

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).

Sediment Sampling

- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Water Sampling

Project Name: Bremerton Gas Works RI/FS Marine Sampling	**Project Number:** 131014-01.01	**JSA Number:** 003	**Issue Date:** April 8, 2015
Location: Dyes Inlet, Bremerton, Washington	**Contractor:** Anchor QEA, LLC	**Analysis by:** Tracy Schuh	**Analysis Date:** April 8, 2015
Work Operation: Water sampling	**Superintendent/Competent Person:** Tracy Schuh	**Revised by:** N/A	**Revised Date:** N/A
Required Personal Protective Equipment (PPE): • Modified Level D – Long pants or coveralls, steel-toed footwear conforming to American Society for Testing and Materials (ASTM) F2412-05/ASTM F2413-05, nitrile gloves, U.S. Coast Guard-approved personal flotation device, safety glasses • Depending on activity, hard hat may also be required		**Reviewed by:** Nathan Soccorsy **Approved by:** Nathan Soccorsy	**Reviewed Date:** April 8, 2015 **Approved Date:** April 8, 2015

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow Job Safety Analysis (JSA) for boating activities.	
Water sample retrieval	Slips, trips, and falls	• Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants/seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Be cautious when entering or exiting the vessel, and load/unload items onto/off of the pier or shore once boarded. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.

Water Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Water sample retrieval (continued)	Ingestion of contaminants, skin/eye contact with contaminants	• Wear appropriate PPE to prevent/reduce exposure. • Contact 911, as necessary; perform CPR if breathing stops. • Move exposed person away from source of contamination, and rinse mouth. If exposure to skin occurs, promptly wash contaminated skin using soap or mild detergent and water. Rinse eyes with large amounts of water. • Follow decontamination procedures as outlined in the HASP.	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.
	Pinch points	• If boating, secure any unsecured objects on deck; they may shift on deck quickly in wave/current/engine acceleration conditions. • Maintain safe distance from closing mechanisms and moving parts on sampling gear. • If boating, avoid placing hands or self between boat and dock/piles.	
	Muscle strain/injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects, buckets, or other unwieldy equipment. • If boating, avoid carrying objects directly onto or off of the boat; rather, load/unload objects while on the boat to/from the pier/shore.	• Evaluate weight and center of gravity of heavier items prior to lifting/moving.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery/equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.

Water Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Rain	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions.	• PPE should be inspected daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides for at least 20 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.
	High winds	• Wear goggles or safety glasses if dust/debris is visible.	• Ensure that goggles/safety glasses are available.

Training Requirements

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Beach Sampling

Project Name: Bremerton Gas Works RI/FS Marine Sampling	**Project Number:** 131014-01.01	**JSA Number:** 004	**Issue Date:** April 8, 2015
Location: Dyes Inlet, Bremerton, Washington	**Contractor:** Anchor QEA, LLC	**Analysis by:** Tracy Schuh	**Analysis Date:** April 8, 2015
Work Operation: Beach sampling	**Superintendent/Competent Person:** Tracy Schuh	**Revised by:** N/A	**Revised Date:** N/A
Required Personal Protective Equipment (PPE): • Modified Level D – Long pants or coveralls, steel-toed footwear conforming to American Society for Testing and Materials (ASTM) F2412-05/ASTM F2413-05, nitrile gloves, U.S. Coast Guard-approved personal flotation device, safety glasses • Depending on activity, hard hat may also be required		**Reviewed by:** Nathan Soccorsy **Approved by:** Nathan Soccorsy	**Reviewed Date:** April 8, 2015 **Approved Date:** April 8, 2015

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow Job Safety Analysis (JSA) for boating activities.	
Shellfish sample retrieval	Slips, trips, and falls	• Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants/seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Be cautious when entering or exiting the vessel, and load/unload items onto/off of the pier or shore once boarded. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.

Beach Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Shellfish sample retrieval (continued)	Ingestion of contaminants, skin/eye contact with contaminants	• Wear appropriate PPE to prevent/reduce exposure. • Contact 911, as necessary; perform CPR if breathing stops. • Move exposed person away from source of contamination, and rinse mouth. If exposure to skin occurs, promptly wash contaminated skin using soap or mild detergent and water. Rinse eyes with large amounts of water. • Follow decontamination procedures as outlined in the HASP.	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.
	Pinch points	• If boating, secure any unsecured objects on deck; they may shift on deck quickly in wave/current/engine acceleration conditions. • Maintain safe distance from closing mechanisms and moving parts on sampling gear. • If boating, avoid placing hands or self between boat and dock/piles.	
	Muscle strain/injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects, buckets, or other unwieldy equipment. • If boating, avoid carrying objects directly onto or off of the boat; rather, load/unload objects while on the boat to/from the pier/shore.	• Evaluate weight and center of gravity of heavier items prior to lifting/moving.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery/equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.

Beach Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Rain	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions.	• PPE should be inspected daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides for at least 20 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.
	High winds	• Wear goggles or safety glasses if dust/debris is visible.	• Ensure that goggles/safety glasses are available.

Training Requirements

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Motor Vehicle Operation

Project Name: Bremerton Gas Works RI/FS Marine Sampling	**Project Number:** 131014-01.01	**JSA Number:** 005	**Issue Date:** April 8, 2015
Location: Dyes Inlet, Bremerton, Washington	**Contractor:** Anchor QEA, LLC	**Analysis by:** Tracy Schuh	**Analysis Date:** April 8, 2015
Work Operation: Motor vehicle operation	**Superintendent/Competent Person:** Tracy Schuh	**Revised by:** N/A	**Revised Date:** N/A
Required Personal Protective Equipment (PPE): • None		**Reviewed by:** Nathan Soccorsy	**Reviewed Date:** April 8, 2015
		Approved by: Nathan Soccorsy	**Approved Date:** April 8, 2015

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Motor vehicle operation	New/unfamiliar vehicle	• Allow yourself some time to get familiar with a rental vehicle or one not used very often. Test lights, windshield wipers, hazard lights, horn, and parking brake, and other important functions. • Allow extra side, front, and back space around the vehicle while driving or parking an unfamiliar vehicle. • Adjust mirrors and seat while vehicle is in park.	• Become familiar with important operating functions and space requirements for the vehicle.
	Vehicle accident	• Plan your travel route and avoid rush hour(s) if possible. • Obey traffic laws. • Use care when backing up; back up slowly and use a spotter for difficult locations or poor lighting, or while trailering. • Drive defensively and park in parking spaces uncrowded by other vehicles. • If an accident occurs, stay in the car and call for help.	• Ensure that insurance information is in the vehicle.

Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Motor vehicle operation (continued)	Distraction while driving	• Stop driving if a potential for a distracting conversation exists. • Do not use cell phones or GPS while driving; ask your colleagues to assist you, or safely pull over to use if you are alone.	
	Fatigue/falling asleep	• Get adequate rest prior to driving. • If feeling slightly tired, change seat position, open windows, and stretch often. • If experiencing extreme drowsiness or fatigue, pull over to a safe place and rest.	
	Weather/road conditions	• Check road and weather conditions on route before traveling; be prepared to adjust and have a plan for alternate stops or travel if conditions change. • Travel in daylight hours when possible. • Allow extra time for delays so that you do not feel rushed. • For road glare, consider wearing sunglasses and use caution particularly when driving during sunrise or sunset.	• Ensure that windshield wipers are in good working order and washer fluid is adequate. • Check tires for adequate tread for road conditions.

Training Requirements

- All assigned employees are required to familiarize themselves with the contents of this Job Safety Analysis (JSA) before starting a work activity and review it with their supervisor during their daily safety meeting.

ATTACHMENT 4
SAFETY RECORD FORMS

I have read a copy of the HASP, which covers field activities that will be conducted to investigate specified areas on and adjacent to the Former Bremerton MGP Site in Bremerton, Washington. I understand the health and safety requirements of the project, which are detailed in this HASP.

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